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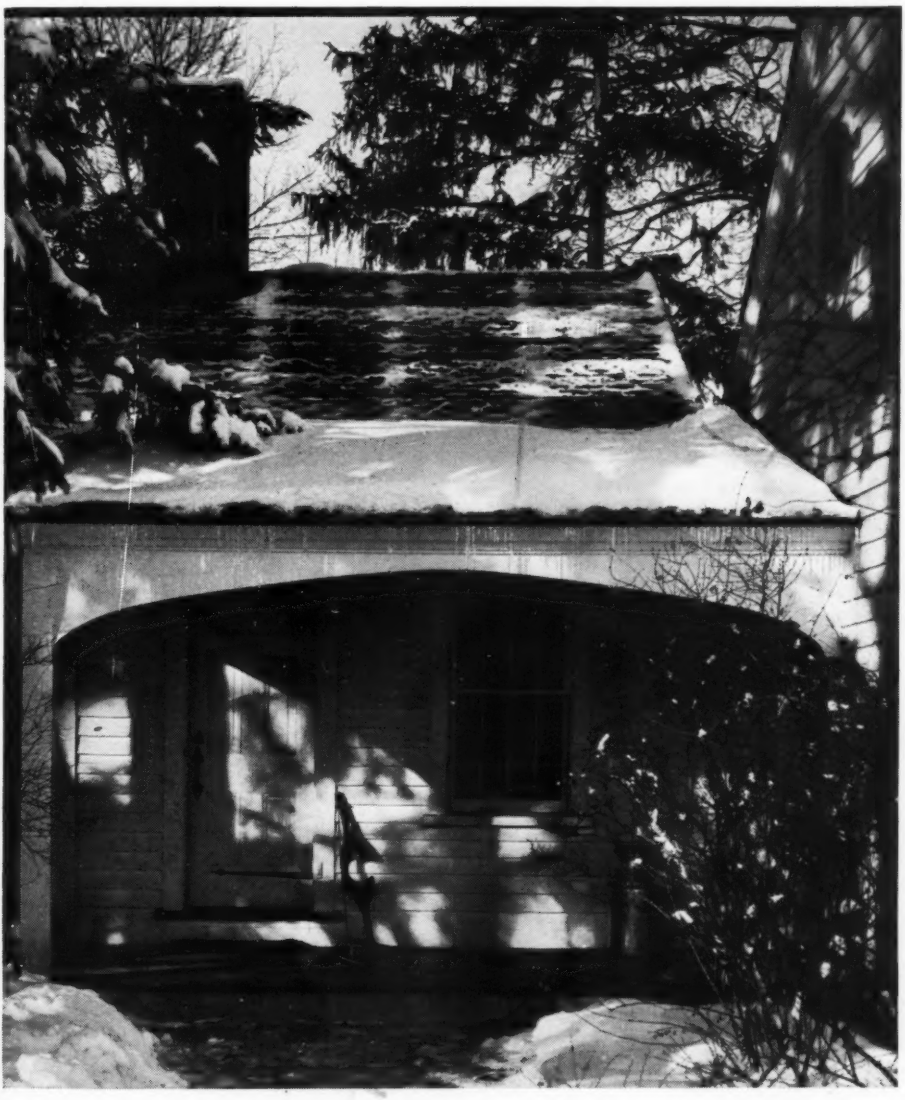

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R. H. STINCHFIELD, *Editor*

Editorial Office: 1155 16th Street, N. W., Washington 6, D. C.

VOLUME XXIX NO. 10

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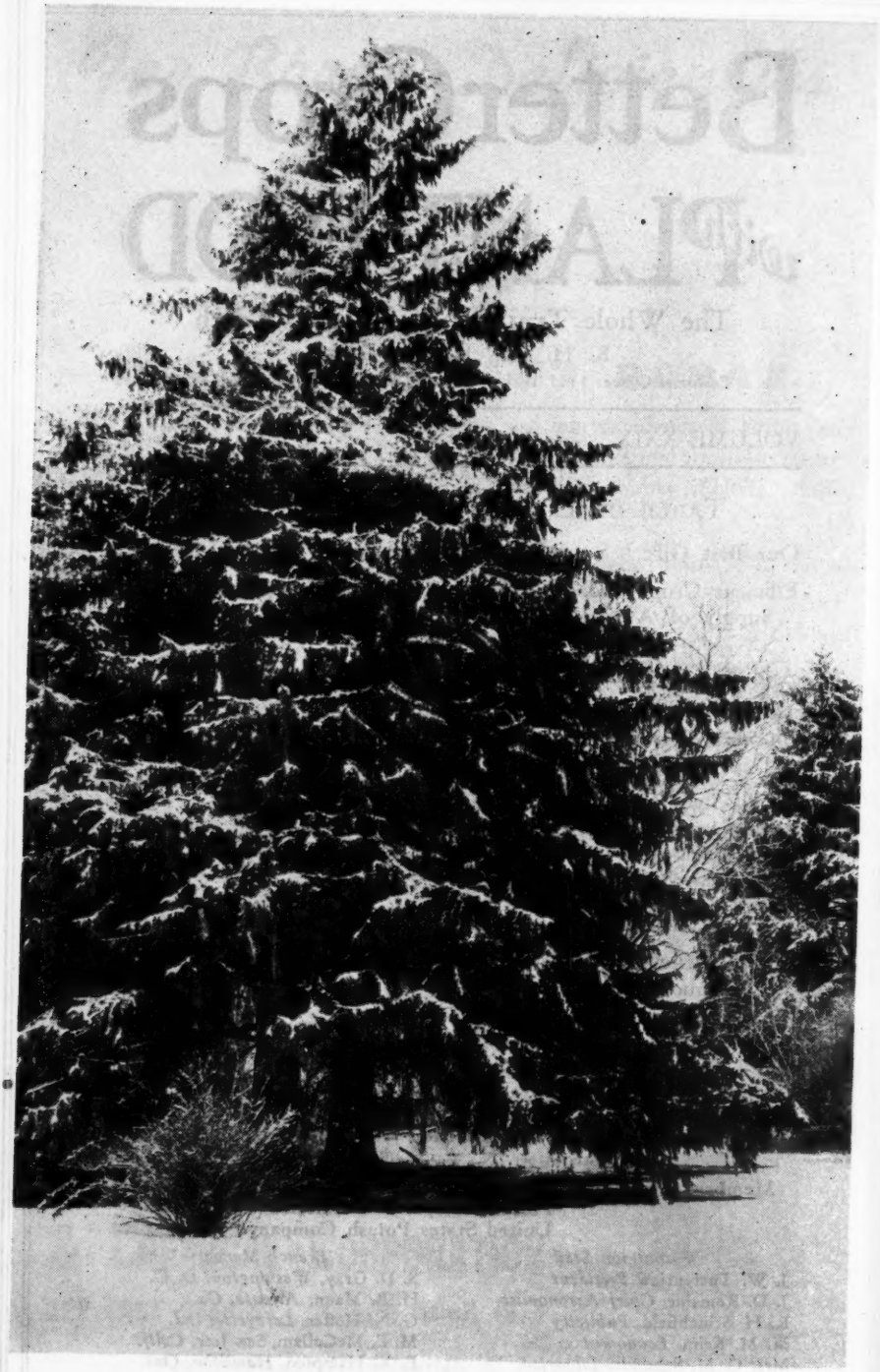

WHAT NATURE ADORNS, FEW CAN SURPASS

Better Crops with PLANT FOOD

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VOL. XXIX WASHINGTON, D. C., DECEMBER, 1945 No. 10

Interpreting

Our Best Gift

Jeff McDermid

OUR most needed gift at this Christmas is not trick ways to avert war or save our towns from "atomashing,"—it's not more autos, more gas, more employment, more circulating money, or more liberty —but it's just greater trust in mankind.

International, interstate, inter-racial human confidence—that's what will do us most good in our old socks on Christmas morning. Unless we get it in some form in more plenty than we have it now, Christmas will be just another paganistic pageant, with more superstition than substance and more tinsel than triumph.

This must happen to us, because they'll be back with us again for Christmas—those homesick boys and girls from Korea, and Kodiak, from Kwantung and Karsruhe—all set for an old-time celebration that means something more than gobble and glitter.

Many of them, like General Jonathan Wainwright in a Nipponese sink-hole, have bitter memories of pitiful makeshifts in Yuletide decorations and starvation rations in lieu of the proverbial feast. Others met Christmas in fox-holes or in weary marches across strange and forbidding lands, wondering betimes what the world had done to their old familiar holiday motto, Peace on Earth, Good Will to Men.

Others cast off into vast stretches of uncharted skies, drawing somewhat closer to the Star which kept the Magi "on the beam" in the Year of Our Lord Number One. That some of them were cursed with stern orders which of necessity included the blasting of homes and hospitals regardless added nothing to their spiritual stability after receiving youthful tutelage in the forgiveness of sins and the virtues of mercy and tolerance.

Others "went down to the sea in ships" and wondered sometimes if they would ever become "true fishers

of men" instead of eternally manning the lookout for enemies afloat and targets ashore. That all these conflicting thoughts and contrasting emotions and the raw and wretched conditions of life they faced have left some marks upon our Christmas prodigals must be admitted and proper steps taken to counteract.

In my lifetime we have never entered a Christmas season of just this significance. I suppose there has never been a Christmas when everybody was comfortable everywhere. You Kiwanis and Rotary gents and associates in churches and good-will organizations have spent many days planning former donations of sustenance to the poor and the unfortunate, and we usually had some of them with us even in the boom days.

BUT never before have we met up with a Yuletide which was so deeply sunk in abject world-wide misery, or one that needed fortitude and tolerance and charity and common sense all woven into it, like this one does. And if you don't grasp it from where you sit, be sure you'll get an earful when the kids come home.

Yet for some of us the Yuletide celebration is far from complete. There are still too many vacant seats in the family circle and around the turkey table. Toward those who will never return we have partly adjusted our emotions, but in respect to those three million or more living soldiers obliged to pass the holidays abroad, it is easy to be impatient and importunate. Four years of war's alarms and rigorous sacrifice of personal feelings to the greater goal of eventual victory leave us in poor shape to resist the primitive human cravings for absent loved ones. Especially do such yearnings press in upon us when the familiar Christmas traditions are dusted off once more for the annual winter demonstrations.

Thus, too frequently our anger and frustration fuse with the common disillusionment of the G. I. and the sailor—those kids who only yesterday came to us as students seeking help to find the capitals of Europe or the mountains and the rivers and the oceans of the world. They have since found them the hard way.

Back there in their grade-school days, you remember how it was with us, half the time we didn't know the answers. By some subtle shift of approach we hid our ignorance of forgotten or unlearned geographic facts and we marched the youngsters back to school to get their education by proxy—where they ought to get it because we paid big taxes for teachers, by gum! And what was probably worse, we gave them dimes for Sunday school lessons taught by some other more responsible citizen, while we went out to play golf or see a ball game.

So I guess maybe we can't blame the war prodigals for toting back some queer distorted mental souvenirs along with the grotesque idols, shawls, and scarves they pack home to distribute at Christmas. We of the parental "commanding generation" fell down on our job of providing prewar USO comforts and stimulations to some extent, right in our own home circles. We talked in generalities about world unity when there was no unity of our own making, and we prated about peace when there was no peace.

WE left all the isms and the theories and perplexities of international relations to somebody else. He was that Mr. Somebody who got appointed to office in Washington by somebody who got the most votes the second Tuesday of November every four years. He was the scapegoat selected to handle our foreign relations. Then if he came to the table no better prepared to play poker with the shapers of razor-edge diplomacy than we were back there in old Bingville, we said it was the party's fault, not ours. And democracy got another dent in its armor just because we didn't know or care.

Then in the midst of our doldrums and indifference, newspapers and mag-

azines began to print mistrustful doings with the youth of Europe—a sweep of savagery and callous discipline. Over there they kept controlling hands on the shoulders of the boys and girls and neglected no opportunities for guidance. Our idea of letting the kids alone to learn the facts of life themselves was in for a real test.

That test has been the headline experiment of the era during four long years and their dismal Christmases. There have been plenty of nasty pills to swallow and vain regrets to slobber over, too. Finally it all came to a head like a broken boil, climaxed with the billion-dollar bomb affair—and the hangover is with us and we don't know how to stop the headache.

We have enjoyed a joyful Thanksgiving, except for some things which are rather obscure and insecure for a proper all-out gratitude. Now, we start into the first Christmas since 1938 without a world at war. We begin our shopping with a renewal of old elbowing and pull-hauling and scrambling, meanwhile trying to forget that Professor Oppenheimer or some other physicist says that the next thousand atom bombs won't cost us so much to build, although they'll be just as hard to dodge unless we all move down into deep burrows.

At this crossroads in human life about all we have left to snub up to or cast anchor in are those ideals and customs of Christmas. They give us a slender foothold, at least, from which to cast off into the unknown. To keep on raking over the ashes of burned hopes left in the ruins of war (who says America remains unharmed?) is not to be worthy of Christian citizenship. For this holiday here, even in its weakest and most contradictory aspects, is a place of serenity and joy contrasted with the horror and hunger in other lands. Perhaps renewing these pleasant traditions again under the green tree truce of Christmas will give us gusto to carry on when New Year's opens a fresh calendar to fill.

YES, I said "gusto," for I like men of good will and gusto. Gusto is my meat when it stops short of bombast and fakery. I don't care a whoop and a holler for weak-kneed, apologetic, indifferent specimens with no red blood to expend in righteous rebellions. Leave our destiny to them and we would get another Pearl Harbor and cringing from billion-dollar bombs.

Speaking in behalf of gusto, I mean a militant and inspirational leadership, free from brass-hatting, thoroughly infused with enthusiasm. Only through a courageous leadership can we keep from lapsing into that sewing-circle coma in which we raised our kids.

I guess you'll find men of gusto and good will in the Bible, too. Old Abraham had a store of it, and so did Moses, the mountain climber. General Joshua had his share. King David had a mite too much sometimes. Solomon was steeped in gusto and imagination enough to vision a temple in a desert land. When you thumb through the newer books of the Bible you find good will and gusto in almost every chapter.

Begin with flinty and fearless old John the Baptist and carry on through the Twelve redoubtable fishermen and villagers, the strong men of the parables, and the Man of Galilee who

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Fig. 1. Defoliation of cotton on grey land of the Tennessee Valley (Walter Dorning's farm in Limestone County, Ala.) resulting from the application of approximately one ton of limestone per acre in 1941 with insufficient potash in the cropping system. Photographed, August 29, 1944.

Efficient Crop Production Means Balancing Supply of Available Plant Nutrients

By Howard T. Rogers

Agricultural Experiment Station, Auburn, Alabama

IN the postwar period with all of its drastic adjustments in crop acreages and imponderables in the economic world the farmer needs to be forever mindful of the importance of a balanced as well as an adequate supply of plant nutrients for maximum efficiency in crop production.

Proof that this balance of the plant nutrient supply is an extremely delicate equilibrium in many of our southern soils is being revealed in some of our long-time experiments. Here in the southeastern states, a region of highly leached soils, this problem of balance of available plant nutrients is more critical than in other sections, where the soils possess a much greater reserve of the essential elements.

It is now generally recognized that too much lime added to many of our soils may cause deficiencies of some of the so-called minor elements. Where we are dealing with the elements that are frequently present in an available form in only fractional parts per million, it is really quite easy to see why any material change in the acidity of the soil solution might induce severe deficiencies. On the other hand, it has been thought that plants are tolerant to wide fluctuations in the supply of the

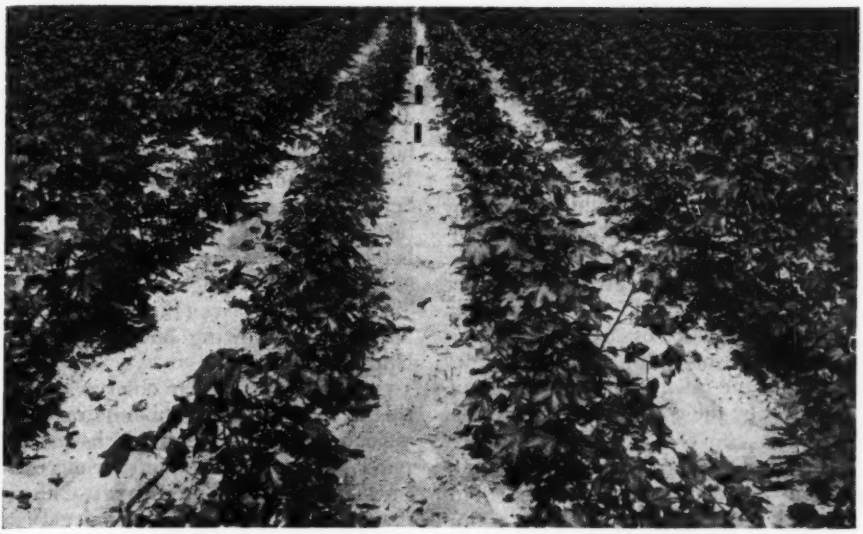

Fig. 2. Cotton plants on a part of the field pictured in Fig. 1 which received the same fertilizer treatment but no lime.

elements that are taken up in larger quantities, including nitrogen, phosphorus potassium, and calcium. The different crops vary tremendously in their plant-food requirements and our soils are changing constantly in their chemical make-up as a result of cropping systems, erosion, and residual effects of the application of large amounts of commercial fertilizers over a period of years. These residual effects are pronounced in altering the ratio of some of the minerals available for plant growth.

Numerous experiments and cooperative field tests with farmers in every section of the State have demonstrated the value of lime for improving pastures and increasing crop yields with legumes that receive ample phosphate and potash. Although rather intensive lime and legume programs were put on by agricultural leaders in Alabama over a period of years, as late as 1942 farmers used only 42 pounds of calcium carbonate equivalent material per acre of crop land and pasture. This figure is based on county agent reports of the amount of lime applied as such, the tonnage of basic slag (data from the producer), and calculated tonnage of dolomite used to neutralize mixed fertilizers. This appeared to be a low consumption of lime when compared with New England, Midatlantic, and most of the Midwestern states, in view of the inducements offered farmers through the AAA program of the Federal Government.

At first it was somewhat difficult to understand why Alabama farmers were not using more lime. However, a careful study of some of the older lime experiments on the substations when combined with the experiences of observing farmers reveals at least one explanation. In some cases lime alone, or with small amounts of mineral fertilizer, actually decreased yields.

Striking evidence that lime increased the need for potash by cotton on Hartsells fine sandy loam was observed in lime tests at the Sand Mountain Substation near Crossville, Alabama. During the first six years of this 16-year-old experiment, limestone gave profitable increases in cotton yields in a cotton, winter legume, corn rotation. Despite this early response, the beneficial effects of lime began to disappear, and in the last five years of the experiment cotton yields have been decreased by lime. On

those plots that received 600 pound of 6-8-2 fertilizer per acre, the yields of cotton fell off sooner than where 6-8-4 fertilizer was used. However, 600 pounds of 6-8-4 per acre did not supply enough potash to maintain yields where one ton of limestone was applied once every 10 years. It should be pointed out that while lime decreased the cotton yields after several years, it is required for successful growth of winter legumes on the soil. This obviously was not a case of overliming, but showed the need for more potash to maintain the calcium-to-potassium ratio required by the cotton plant for normal growth.

Walter Dorning, a Limestone County cotton grower, found that lime increased the need for potash on cotton on the grey lands (Dickson silt loam) of his farm. In 1941, he limed a part of a field at the rate of about one ton of limestone per acre. In 1944, the entire field was planted in cotton and fertilized with 300 pounds of 6-8-4 per acre. As early as August the cotton had lost practically all of its leaves on the limed portion of the field and produced about 100 pounds of lint cotton per acre (Fig. 1), whereas normal plants were growing on the unlimed part which produced a bale of cotton per acre (Fig. 2) with the same fertilizer. The field was planted in vetch in the fall of 1944 and followed by corn in 1945. When the field was visited in September, corn on that part of the field that had been limed four years before showed severe potash deficiencies as evidenced by lodging and marginal "firing" of the leaves (Fig. 3). Normal plants were growing on the unlimed land (Fig. 4).

A number of similar observations of this detrimental effect of lime on crop yields where insufficient potash was applied have been made in various sections of the State in recent years. These demonstrations are not restricted to deep sands or high-lime soils, but include sandy loams of the Coastal Plain as well as fine sandy loams and silt loams of north Alabama, as previously illustrated. Furthermore, the rates of lime involved would be considered moderate or even low as judged by past standards. The point in case is that the balance of available plant nutrients

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Fig. 3. Lodging of stalks and marginal "firing" of corn leaves as indications of potash deficiency brought on by the application of limestone. Corn following cotton shown in Fig. 1 on Walter Dorning's farm in Limestone County, Ala. Ptotographed in September 1945.

And Now the Imperative for Agriculture and Industry

By D. S. Coltrane

North Carolina Department of Agriculture, Raleigh, North Carolina

WE have won the greatest military conflict of all times. We are enjoying peace for the first time in almost four long years. It is now imperative that we turn our thoughts to peace just as we did to war on December 7, 1941, and that we consider the kind of world economy that will face us or that we will desire to build in the postwar days.

In our wartime economy, all economic laws were suspended or thrown out the window. We had only one job to do—Win a War—regardless of economic laws or any reckoning with the future. Now that the end has come, many adjustments will need to be made in our entire national economy.

The changes and adjustments in our industrial economy are tremendous and present gigantic problems. No less so will be the changes and adjustments in agriculture which need to be considered if we are to plan for the best interests of the social and economic welfare of the State and Nation.

Relationship Between Agriculture and Industry

It is certain that the welfare and prosperity of the Nation rests upon its two foundation stones, its Industry and its Agriculture. It is self-evident that each of these foundations depends upon the other for its security and prosperity. We learned from the depression that when this Nation's industries were idle and workers without wages, farm products became surpluses which could not be sold. When farmers could not sell their products, they could not buy the products of our industries, thereby establishing a vicious circle that disrupted our national economy.

It is evident that agriculture will, as it did following World War I, feel the full effects of the adjustment in production from war to peace. We can guess that the effects will be even greater this time due to the much closer relationship which now exists within our several segments of human effort—technology of production, the elimination of time and space in transportation, and many other factors which will tend to make this true.

American agriculture during these four years of war has been geared to its highest peak of production. The farm output has reached an all-time high. In 1944, 15 per cent fewer folks on farms produced 50 per cent more farm products than during World War I. Fifteen per cent fewer folks on farms are now feeding 35,000,000 more people in the United States than during World War I. This peak production has been attained notwithstanding restrictions of every kind—labor stortages, shortages of fertilizer, machinery, and transportation. By the use of the newer technologies of production, it is easy to produce today.

The big problem which confronts our American agriculture today is the probable future demands and continuing demands for this vastly stepped-up agricultural production.

The war has taught the American farmer that when there is full and continuous employment at high wages, he in turn prospers. The farmer is, therefore, or should be directly interested

in the well-being of industry and labor as never before. He can no longer be an independent or isolationist in our future national economy.

There is much apprehension that the postwar period may not call for the present agricultural production. This apprehension is well founded, for all farmers are deeply aware that the agriculture of today is more productive and more prosperous than at any previous time. They can sell their products today; they are paying their debts; and they have income to plan for the future. They will, of course, recall their situation of a few years ago when so-called farm surpluses and lack of demand for their products confronted them on every hand.

The Problem of Efficiency in Lowering Costs of Production

With the return to peacetime conditions and with our increased ability to produce, and with the necessity to place our products in a highly competitive world market, it is certain that costs of production will have a very vital part to play in our future successful farm production. Through mechanization and other technological advances, much progress has been made in certain fields of agricultural production. In others, much less progress has been made. Field crops, such as tobacco, corn, oats, and cotton are good examples of greatly increased efficiency in production, while certain imperative livestock products, such as butter and meat, show no such comparable advances in the efficiency of production and the lowering of the cost of production.

With the availability of reasonably satisfactory substitutes on every hand and from every corner of the world, agriculture can no longer ignore giving the closest attention to the efficient production of its products. Farmers who refuse to produce at the lowest possible cost and to adopt the most efficient practices of production cannot be considered in the agricultural policies of tomorrow.

Farming is a business and must be so recognized in the postwar world. It will be run as a business with just as much care and efficiency as will be found in any similar sized or capitalized industrial or urban business. This more universal adoption of business-like operation of our farms, with efficient methods in management and operation, is a postwar change of great magnitude.

Productive Income

Basically we have learned how to produce wealth faster than we have learned how to distribute and conserve it. We have been producing about $150,000,000,000 in income, roughly half going for war purposes. If we return to the manufacture of consumer goods and consume the same number of units we did during the prosperous twenties, it is estimated that we will consume about $100,000,000,000 at present prices. Added to this would be what we would invest in plants, equipment, housing, and other durable goods. To absorb our total output would mean that we must increase our consumption, including investments, possibly 50 per cent. If we fail to consume this volume, we must either reduce our production or export the surplus; and if we export the surplus, we must bring in imports which we will have to consume. The real problem which must be solved, therefore, is that of consuming what we are able to produce at prices which will enable us to maintain production. This is what we call an economy of plenty.

In studying these problems, the guideposts of one of our national farm organizations should prove helpful:

1. All prosperty springs from the production of wealth, or any program which retards the production of wealth is unsound.

2. The compensation of each should be based on what he contributes to the national welfare.

Farm production multiplied by price gives the annual initial income of

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Fig. 1. White Dutch clover from seed grown in Louisiana for similar environments is productive and reseeds prolifically irrespective of grazing intensity.

Florida's Legume Pastures Depend on Seed Source

By R. E. Blaser

Department of Agronomy, University of Florida, Gainesville, Florida

IT is generally known that pastures with grasses and legumes growing together are desirable because leguminous plants lengthen the grazing season and increase the quality and productivity of pasture herbage. To establish clovers successfully in Florida the soil must be properly limed and fertilized and certain management, cultural, and seeding practices must be pursued. Failures or poor growth frequently occur because seed of strains of legumes which are not adapted to Florida environmental conditions are used.

A large number of winter annual or perennial legume species have been tested for adaptation to Florida environmental conditions. Seed sources of White Dutch, Black Medic, California Bur, and annual white and yellow blossom sweet clovers have been tested. This discussion will be limited to strains of these four species. Of these, White Dutch clovers are best adapted to moist soils. Soils of the flat pine areas with a high water level and a 6- to 12-inch layer of dark surface soil which is high in organic matter are especially suitable. Black Medic and California Bur are adapted to soils which are reasonably well aerated. The annual sweet clovers are widely adapted, but grow best on well-aerated soils. Black Medic, California Bur, and sweet clovers grow best in soils high in calcareous material or soils limed liberally.

Test plots were established in 1937 to 1941 to compare strains of White Dutch clover. Seed sources in these tests were Mississippi, Louisiana, Oregon, Virginia (Dixie strain), New York, New Zealand, and England; Ladino was also included in the tests. These strains differed greatly in productivity; the growth from Ladino, Louisiana, and Mississippi sources of seed was more productive than the other strains. English, New Zealand, and northern-grown strains produced relatively low yields and seeded sparsely or not at all. Although Ladino produced satisfactory yields, it is not recommended because it did not reseed in Florida during three-year tests in two locations. Seed production for volunteer growth is necessary since White Dutch clovers are often winter annuals rather than perennials in Florida. On the basis of these experiments, strains of White Dutch seed grown in Louisiana or similar environments are recommended for Florida.

The Pinebreeze Pullet Farm established a 50-acre clover pasture which was dwarfed in growth and failed to produce seed. Upon investigation it was found that good fertilizer, seeding, and cultural practices were used but that northern-grown seed was used. The plants maintained vegetative growth for a long season but failed to reseed. Adapted strains of White Dutch clover grow tall and seed heavily irrespective of grazing practices as shown by Louisiana strains (Fig. 1).

Since 1941, several tests in different locations were set up to study the growth characteristics of Black Medic seed from different sources. Black Medic seed was harvested from plants in various locations from volunteer growth along railroads and roadsides. Commercial seed were purchased from a number of seed companies to compare growth, seed production, and morphological characteristics with strains of Black Medic from Florida. The commercial seed, with the exception of a small amount of Alabama seed, was apparently imported. The mean relative forage and seed yields and volunteer growth of plants grown from Florida and commercial sources of seed differed greatly (Table 1). In the Callahan test the 12 Florida strains produced an average relative yield of herbage of 100 during the early season of the first year after planting as compared to only 9.2 for plots seeded with four commercial sources of seed.

The seed yields per acre averaged 128 pounds from plants of Florida seed

TABLE 1. COMMERCIAL AND FLORIDA STRAINS OF BLACK MEDIC COMPARED*

Source of Seed	Gainesville (1)		Callahan (2)			Waldo (3)	
	Relative yield 1st year 1942	Volunteer growth 1943	Rel. yield 1st year 1943	Vol. growth 1944	Seed yields lbs. A.	Rel. yield 1st year 1945	Seed per pound
Florida Strains	100	Very good	100	100	128	100	361.020
Commercial Imported Strains	22.9	Very unsatisfactory	9.2	14.4	2.5	6.0	247.242
Commercial Alabama Grown	.....	.....	.....	.....	.....	146.0	363,163

* All yields for the first season's growth are early season yields only. Later yields were not taken because of grass contamination.

1 Data are means for replicated plots of 4 commercial seed lots and 8 Florida strains.
2 Data are means for replicated plots of 4 commercial seed lots and 12 Florida strains.
3 Data are means for 3 commercial seed lots, 4 Florida strains, and 1 Alabama-grown commercial strain.

from 12 different sources as compared with an average of 25 pounds of plants grown from seed of four commercial sources. Black Medic is a winter annual in Florida, thus seed production for subsequent year's crops is very necessary. The volunteer growth as shown by relative yield during the second year on the Callahan test was 100 for Florida strains and 14.4 for commercial seed sources. This is attributed to the very poor seeding of commercial strains.

The growth responses of plants from seed of commercial and Florida sources in the Gainesville test were similar to that given above. Typical photographs taken during the second year show a very poor growth and stand of plants from commercial seed and an excellent volunteer growth from plants of Florida seed sources (Fig. 2). Most of the plots originally seeded with commercial strains in 1941 had no plants or only a few scattered plants in 1943 which possibly volunteered from the seed broadcast in 1941. The Florida strains in this test have continued to volunteer and make excellent growth through 1945.

Black Medic plants grown from imported commercial seed and Florida seed differ in morphological characteristics as shown by plants of identical age taken from space-planted breeding tests. Black Medic plants from commercial seed sources grow slowly and require long seasons to mature seed. Due to the slow growth the internodes are short and the plants appear as very leafy rosettes. Seed from Florida sources produce rapid-growing plants which mature in a comparatively short growing season. Because of the rapid growth, the Florida strains have long internodes and are rather stemmy in appearance. The plants from Florida seeds produce plants which mature seed early; whereas, the commercial imported strains are late seeders. During a four-year period the commercial strains have failed to reseed due to the lateness of seed setting and concurrent dry weather. Even under favorable conditions it is doubtful if much seed would develop on plants from commercial strains because of sparse blooming.

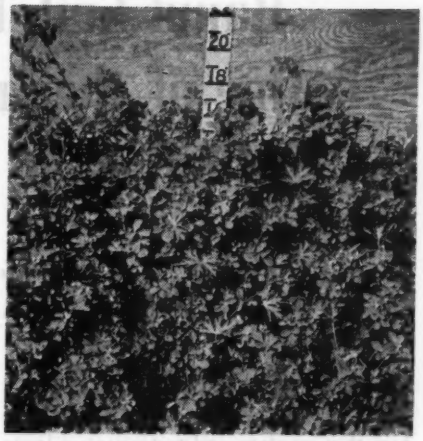

Fig. 2. Growth and type of plant are associated with sources of Black Medic seed. Second year's volunteer growth from a Florida strain, above; a commercial strain, below.

The seed size of different strains differs greatly as shown by the number of seed per pound. The Florida strains produce much smaller seed than commercial imported strains (Table 1). The seed size of Alabama-grown Black Medic is similar to Florida strains in size. The size of seed may serve as a possible guide to adaptation.

Strains of annual sweet clovers, both white and yellow blossom, differ greatly in productivity of seed and herbage

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Rapid Soil Tests Furnish One of the Implements for Increasing Crop Yields

By Benjamin Wolf

Seabrook Farms Company, Bridgeton, New Jersey

ONE often hears the value of rapid soil testing questioned, despite the fact that modern soil testing on a large scale has been conducted for more than a decade. Many thousands of samples from various locations in the United States have been analyzed. Several commercial organizations and nearly every experiment station in the country are now conducting rapid soil tests in great numbers. In some cases, the soil-testing services at the experiment stations have been established at the request of farmers within the state. In general, farmers have been quick to take advantage of the tests and have come to depend upon the results.

It is surprising, therefore, that with this mass acceptance of rapid soil testing there still should be questions as to whether it is worth while. Many of these questions stem from the fact that within the questioner's experience, rapid soil tests for one reason or another have not performed satisfactorily. There have been various reasons for this disappointment but one of the foremost has been the failure to adapt a set of procedures suitable for the soils and crops investigated.

In using rapid soil tests, the G. L. F.-Seabrook Farms Raw Products Research Division has attempted to adapt a particular set of procedures for determining whether nutrient levels of certain soils were suitable for particular crops under study. This has meant not only a study of the soil but the crop as well. Indications are that this particular adaptation of soil tests is paying dividends in various ways of increasing returns from growing crops. It may be advantageous, therefore, to carefully consider how soil tests are being put to work in this laboratory. Such an examination of one laboratory using rapid soil tests may help to assess the true value of soil tests in general.*

Result of Analyses

This laboratory has analyzed approximately 10,000 soil samples in the past four years, representing approximately 25,000 acres of South Jersey farms. About 15,000 of these acres are operated by Seabrook Farms. The others are operated by individual farmers who are patrons of the G. L. F. cooperative and/or supply vegetables to the packing division of Seabrook Farms (Deerfield Packing Company). For the majority of this acreage, fairly detailed records as to treatment and yields are available for a number of years. These records have given the opportunity to make needed correlations so as to evaluate the soil tests in practical terms.

It might be advantageous to point out some of the measures that we have had to adopt to make the rapid soil tests give accurate and useful information. These measures have affected

* It would be well to point out here that the Research Division uses various means of gathering information concerning crop production. Rapid soil testing is but one of the methods which include rapid plant tests for both soluble and total nutrients, pot and field experiments, and longer soil and plant test procedures. Only rapid soil tests are being considered in this paper because they have been subjected to the most criticism.

the accuracy of all three phases of soil testing; namely, sampling, determination of nutrients, and the interpretation of results. Considerable work remains to be done in this direction, but we feel that sufficient work has already been accomplished to make rapid soil tests, at least for this area, a valuable tool for obtaining maximum returns from vegetable farming.

Representative Soil Samples

In setting up standards for sampling, it was realized that a soil analysis, no matter how carefully it was performed, could correct for inaccuracies in sampling technique. Also, that the average soil is a heterogenous mass from which it is difficult to obtain a truly representative sample.

In the beginning, we clearly outlined our objective to be the sampling of a field in such a manner so that it could serve as a basis for the practical applications of soil amendments. It had to be sampled so that results of a duplicate sample taken immediately would not suggest marked changes in the rate or kind of application.*

This has meant limiting the size of the area represented by a sample to about five acres.** About a dozen borings are composited to form one sample representative of the area. All atypical areas, such as knolls, depressions, eroded strips, etc., are omitted. If these areas are large enough to be handled as individual units, they are sampled separately; otherwise they are ignored, lest a boring from such an area markedly affect the results of an entire sample. On the same basis, soil has not been collected from portions of the row where bands of fertilizer have been located. Fortunately, most of the fertilizer in this area has been broadcast before or after plowing, with a resulting uniform distribution of nutrients. Where banding or row fertilization was the common practice, samples have been collected after plowing or considerable cultivation had taken place, in order to insure mixing of fertilizer with the soil. By observing these few precautions, it has been possible to collect samples which definitely meet our objective as stated above.

Procedures Must Be Accurate

In putting soil tests to work, it has been necessary to focus considerable attention to the accuracy of the chemical determination. This accuracy is dependent upon many factors, such as the effectiveness of the extracting solution, temperature of reaction, order of mixing reagents, rate of shaking, presence of interfering substances, length of time of standing before reading, and individual differences in reading the tests.

Samples have been air-dried and sieved to remove stones and debris before making the various tests. Tests for soluble nitrogen fractions are run on fresh samples as soon as possible after they are received from the field.

The extraction of nutrients has been accomplished by the use of Morgan's extracting solution (2) which seems to be well adapted for the Coastal Plain soils of low exchange capacity in South Jersey. A definite time interval (1 minute) of shaking soil and extracting solution has been used. The use of activated charcoal as suggested by Peech and English (3) has eliminated the off colors and interferences due to soluble organic matter.

A pH meter using a glass electrode has been used to accurately measure pH. A soil suspension of one part soil to one part water is allowed to stand at least one hour and not more than eight before the measurement is made.

Organic matter is determined by a modification of the Schollenberger method, using the reaction of concentrated reagents to produce the heat (4). It has been found that some

* This permits a variation of about 100 lbs. of fertilizer, about 500 pounds of liming materials, and about a half ton of organic materials per acre since our present machinery cannot spread these materials with any greater accuracy.

** This is about the smallest area in most fields that can be handled separately and practically under our present system. In old fields, the field is divided into five acre areas and sampled. Where small fields have been brought under company control and combined into one large field, it has been necessary for several years, to sample the field on the basis of the old divisions.

sodium dichromate and ferrous ammonium sulfate must be drawn off and discarded each time a new batch is determined. These solutions change in strength when in contact with rubber connections and solution within the siphon will have a different strength than the remainder in the bottle.

The tests for the various nutrients are based on Morgan's procedures but have been modified in various ways. Some of these modifications have been published (5) (6).

Use has been made of the phenol-disulfonic acid reaction to determine nitrates accurately. A quicker method using Brucine has also been suggested.

Ammonia is determined by Graves reagent. This reagent has an advantage over usual Nessler reagents in permitting the determination of ammonia in the presence of large quantities of salts.

In the phosphorus determination, accuracy has been increased by the use of amino-naphthol-sulfonic acid solution as a reducing agent. It has the advantage of not deteriorating as rapidly as stannous chloride solutions. Likewise, it is possible to supply a definite amount of reducing agent which often is not accomplished by the use of powdered stannous oxalate or tin rods.

In the potassium test, greater accuracy has been obtained by the use of the cobaltinitrite reagent suggested by Peech and English (3) and by the use of formaldehyde to eliminate the interference of ammonia (1). The effect of speed of mixing alcohol with other reagents has been controlled by adding the alcohol from an automatic, 10 ml. pipette placed at a standard height above the vial. This, in addition to inversion of the contents after stoppering, has assured uniform mixing which is so essential for accurate results.

It has been found that the accuracy of the calcium tests is dependent upon the age of sodium oxalate solution used to precipitate calcium. For best results, a fresh solution is used. Also, sodium oxalate seems to vary from lot to lot, indicating a need of standardizing each new lot of this chemical.

In the magnesium test, Dr. Grubler's Titan Yellow is used. Dr. Grubler's is more sensitive than American sources of this chemical. Of the American sources tried, that of Eastman Chemical Company had the greatest sensitivity. The use of dilute solutions of soil extracts has lessened the effect of interfering substance upon the magnesium test.

In general, accuracy of the nutrient tests has been improved by the use of relatively large amounts of extracts or reagents and the use of the photoelectric colorimeter to measure color or turbidity. The procedures using drops of extracts or reagents are subject to error due to difficulties of accurate measurement. Larger volumes reduce this source of error considerably. One of the greatest single improvements in accuracy has been the utilization of a photoelectric colorimeter. This device is capable of distinguishing between small changes in color or turbidity and is not subject to the individual variation or fatigue of the human eye. The sensitivity of this instrument can be illustrated by the fact that it has pointed out certain inaccuracies in procedure.

Basis of Interpreting Results

Of the three phases of soil testing, that phase dealing with interpretation of results is usually most often subject to inaccuracies. This occurs since the interpretation requires the greatest skill and largest amount of information.

We have found that proper interpretation is dependent not only on the correct determination of an accurate sample, but upon a knowledge of the soil and plant with which one is dealing.

The nature of the soil affects the interpretation of rapid soil test results in many ways. A soil's characteristics will influence the rate of leaching, the amounts of nutrients fixed in an unavailable state, the extent of burning from fertilizer salts, and the amounts of liming materials necessary to obtain

a specific change in soil reaction. Information as to nature of the soil along with rapid soil test results must be on hand before deciding on the amounts or kinds of fertilizer, liming materials, or organic matter that need be applied. This information is necessary, also to decide whether a fertilizer application can be plowed under or needs to be banded, whether side-dressings would be beneficial, and whether it is possible to use one large application in place of several small ones. It can be gathered from the foregoing that the soil is one of the most important factors in determining whether a particular application will give a response.

Much of the knowledge of the South Jersey soils has come from an actual inspection of the field. Information as to drainage, erodibility, variation, suitability for certain crops, presence of hardpan, has been gathered from a visual inspection. Knowledge has been gained from fertility experiments in pot and field. Valuable information has been obtained from the determination of base exchange capacity and organic matter contents. The majority of the information has necessarily been collected from an actual study of individual field performance. In doing this, it has been necessary to make correlation studies of crop yields and soil nutrients.

Knowledge of Crop Requirements Necessary

We have found that rapid soil tests will have considerable value only after careful correlation between results of rapid soil tests and yields of a particular crop have been made. Such correlation of actual conditions in a local area affords a true value for properly evaluating the results of the tests. It takes into consideration the variation in crop requirements under particular climatic conditions. As a result of such studies, we have found that it is not enough to list a soil as poor, fair, etc., but it is necessary to determine whether a level of nutrients in a soil is satisfactory for lima beans, spinach, etc. Citing an example from our experiences, it has been noted that lima beans can get along nicely with a soluble potassium content of 100 lbs. per 2,000,000 lbs. of soil. If the amount of potassium is raised much above 200 lbs., there seems to be an interference with proper calcium absorption, and a lowered seed-set results. On the other hand, asparagus, with no problem of seed-set, has given the largest yields of high quality with soil contents of potassium near the 400-lb. level. In fact, no diminishing returns of asparagus had set in with the highest potassium content (450 lbs.) and therefore we do not know what is the upper level for this crop.

By such correlations it is possible to establish levels of nutrients which are associated with high yields for various crops. Of course, such levels will vary to a certain extent with the prevailing weather and with the amounts of other nutrients present.

Results from Four Years of Testing

The rapid soil tests as used by the G. L. F.-Seabrook Farms Raw Products Research Division have been valuable in many respects. Generally, they have helped to appraise existing farm practices and to develop new ones. In the latter respect, results of rapid soil tests are an aid in establishing necessary research on new methods of farming. By their results, it has been possible to ascertain what had to be done and rapid soil tests are now being used to check how effectively these new practices are accomplishing their objective.

Fertilizer Practices That Build Fertility

Prior to the establishment of the Research Laboratory at Seabrook Farms, there was always some question in the minds of the division managers as to whether the fertilizers contained the right analyses or had sufficient minor elements or were applied in sufficient quantities to produce good yields. Any low yields were usually attributed to some deficiency in fertilizer, with all

sorts of guesses as to the necessary changes to correct such deficiencies. The laboratory served as an agency to find out why crops were not thriving when they received the same treatment as some adjacent field with a good crop. In practically every case, the reason was some factor other than wrong application of fertilizers. However, these studies have indicated some of the most economical fertilizer practices consistent with good yields.

A large acreage at Seabrook Farms has been acquired during the past 10 years. Many of these farms were in a low state of fertility when acquired. A definite procedure of cover-cropping, liming, and fertilization was inaugurated to make them profitable for operation. Usually the phosphorus, potash, and calcium were low. These farms were cover-cropped with both legume and non-leguminous cover crops. They were limed with dolomitic limestone, and basic fertilizer analyzing 4-12-8 and containing boron and manganese was applied. In addition to the basic fertilizer, cyanamid at the rate of 400 lbs. per acre was plowed under for some pea fields low in fertility and for all spinach fields. For such fields, the fertilizer application then was equivalent to approximately 1,500 lbs. of a 8-12-8. In addition to the above, spinach fields would receive nitrate of soda as side-dressings when needed. This system of fertilizing and liming has served as a definite procedure for growing vegetables and adding to the soil fertility.

Rapid soil tests now show that on some of the older fields, the phosphorus and potash have increased so that we may be able to change this basic fertilizer. The phosphorus supplies have increased to a greater extent than the potash. We are now thinking of using a smaller application of a 10-10-10 in place of the 4-12-8. This may eliminate the necessity of a separate application of nitrogen now practiced for cyanamid. It would also appreciably lower the application of phosphorus and reduce the potash somewhat which would be in keeping with existing levels in the field. Preliminary field trials have indicated that this practice will give us more returns for money spent on fertilizer. If this method of fertilization is adopted, we still would need to continue our rapid soil testing to ascertain whether we are maintaining the desired level of fertility.

A Measure for Organic Matter and Lime

One of the most striking demonstrations of the value of rapid soil tests has been the way they provide a measure of the importance of proper levels of organic matter and lime for the vegetable crops grown. Our studies would indicate that the proper levels of these factors are prerequisites in successful vegetable crop production. On Seabrook Farms, the use of rather large amounts of mixed fertilizer has usually supplied the major fertilizer nutrients in quantity. On these fields, the lack of sufficient organic matter or lime or both has been responsible for the majority of crop failures not due to weather conditions. In fact many fields having crop failures in seasons of adverse weather were found to be poor in the above factors, indicating that some of the ill effects of weather can be reduced by proper soil conditions. The influence of sufficient organic matter coupled with satisfactory lime applications is strikingly demonstrated in Figure 1.

These results have placed emphasis on the use of sufficient lime and organic matter for best crop results. As a result, we have paid more attention to the lime * content of the soil before planting our crops, making sure that the levels are adequate for the particular crop grown. Also we have attempted to add more organic matter to the soil by means of longer cover-cropping periods and the use of chicken and steer manures.

The need for organic matter and difficulty of improving the level of this

* As will be pointed out later, we consider the calcium and magnesium contents as well as the pH as indicators of satisfactory liming.

factor in the soil have prompted research in this direction. This research has already suggested a farming practice which has the potentialities of revolutionizing our system of fertilization. We are now trying in an experimental way to increase the amounts of organic matter produced by the cover crop by applying fertilizer directly to the cover crop in the fall or late winter. Studies have shown that such fertilization in some cases may as much as double the yields of dry matter produced by non-leguminous cover crops. Such additions of cover crops may also have the added advantage of supplying fertilizers in organic combinations to the succeeding crop. Practical horticulturists have often desired some nitrogen in organic forms,

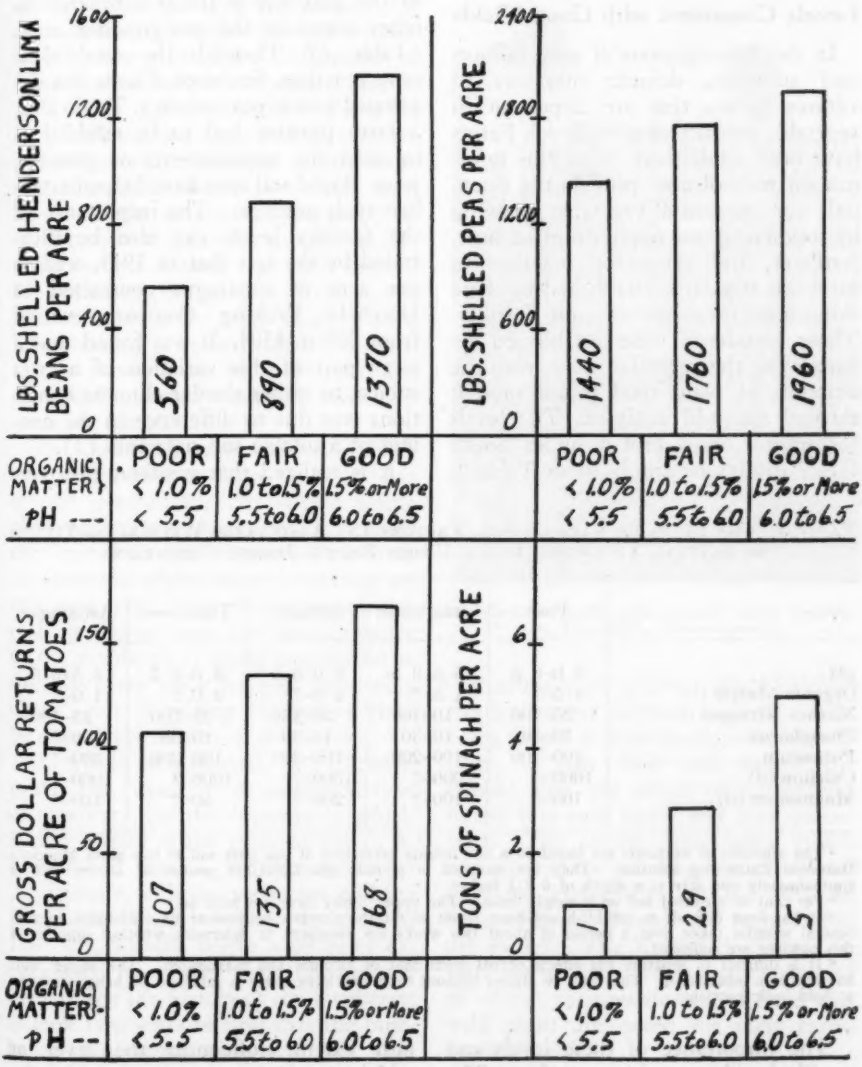

Fig. 1. The influence of soil pH and organic matter content upon the returns of four vegetable crops grown under South Jersey conditions.

but costs of organic nitrogen have been prohibitive. Fertilization of cover crops with inorganic nitrogen seems to be a cheap way of converting this nitrogen to organic forms. Using this system on cover crops plowed under for peas appears to be entirely satisfactory. We have no evidence as yet that it would work as well for other crops where the cover crop is left for a longer period in the spring.

Levels Consistent with Good Yields

In the investigations of crop failures and successes, definite measures of various factors that are important in vegetable production at Seabrook Farms have been established. With this information we can now provide the essentials for successful vegetable growing by modifying our applications of lime, fertilizer, and cover-crop practices to meet our standards established by these minimum measures of soil fertility. These standards were established by correlating the vegetable yields with the amounts of plant food found present through the soil analyses. The levels for several crops grown under South Jersey conditions are given in Table 1.

TABLE 1. THE LEVEL OF VARIOUS SOIL FACTORS (a) ASSOCIATED WITH GOOD YIELDS OF SEVERAL VEGETABLE CROPS UNDER SOUTH JERSEY CONDITIONS

	Peas	Lima beans	Spinach	Tomatoes	Asparagus
pH	6.0–6.5	5.5–6.5	6.0–6.5	6.0–6.5	5.5–6.5
Organic Matter (b)	1.5–?	1.5–?	2.0–?	2.0–?	1.0–?
Nitrate Nitrogen (c)	25–100	10–100	50–150	25–100	25–100
Phosphorus	10–30	10–30	15–30	10–30	30–?
Potassium	100–200	100–200	100–200	100–200	300–?
Calcium (d)	1000–?	1000–?	1500–?	1000–?	1000–?
Magnesium (d)	100–?	100–?	200–?	50–?	100–?

[a] The amounts of nutrients are based on a one minute extraction of one part soil to two parts Morgan's Universal Extracting Solution. They are recorded in pounds per 2,000,000 pounds of air-dry soil or approximately one acre to a depth of 6 2/3 inches.
[b] Per cent of air-dried soil on a weight basis. The upper limits have not been set.
[c] It has been difficult to establish optimum levels of nitrate nitrogen because of its variability in soil. Several samples taken over a period of about two weeks are necessary to determine whether supplies of this nutrient are sufficient.
[d] It is difficult to separate the effects of pH from that of calcium and magnesium. The upper limit has not been established. This may be almost without limit providing there is sufficient exchange capacity to hold basic nutrients.

The importance of these levels can readily be illustrated by two facts. The first concerns the growing of peas. The pea crop, of all the crops grown here with the possible exception of spinach, is the most exacting in its requirements for organic matter, pH, calcium, magnesium, nitrogen, phosphorus, potassium, and trace elements. These we now provide before the crop is planted. Without rapid soil tests, this could not be done satisfactorily. The results of the application of this system are shown by the yield of peas at Seabrook Farms in the past five years as compared to other states in the pea-growing areas (Table 2). Through the established crop practices, Seabrook Farms has developed a new pea industry. To do this, a farm practice had to be established to meet the requirements of growing peas. Rapid soil tests have helped establish such practices. The importance of the fertility levels can also be illustrated by the fact that in 1943, returns per acre of asparagus contracted to Deerfield Packing Company varied from $95 to $504. It was found that a large part of this variation of a crop subject to rather similar climatic conditions was due to difference in the content of available soil nutrients (7).

It is realized that weather, to a certain extent, influences the level at which maximum crop returns can be

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Success With Blueberries

By G. R. Cobb

Salisbury, Maryland

SOME one has said that the way to make money is to have something for sale when the other fellow has none. That is just what John E. Carleton of East Sandwich, Massachusetts, did in 1944. He had blueberries when the other fellows had none and as a result, grossed several thousand dollars from the sale of his berries. A late frost killed off the berries on practically all of the other plantations, but luckily those on his bushes were not injured due perhaps to the location of the plantation and also to the vigor of the plants. The starting price indicated the shortage, as it was from 90 to 95 cents per pint and it never dropped below 75 cents per quart.

Mr. Carleton operates the largest blueberry plantation on Cape Cod. He has several plantations, the largest single planting being of four acres. Some of the bushes in this plantation are over 20 years old while others have been set this past year. He also operates several cranberry bogs, but his allegiance to the cranberry is being transferred to the blueberry since he gets more of a "kick" out of raising blueberries than he does in the culture of cranberries.

As might be expected, Mr. Carleton grows the "modern" or improved type of blueberry, the development of which is due mainly to the work of Dr. F. A. Scoville of the U. S. Department of Agriculture with the assistance of Miss Elizabeth White of New Jersey. In 1906 Dr. Scoville began a series of experiments to learn the fundamental facts in the life history of the blueberry. It took two years to find that the blueberry plant requires an acid soil. He published the first bulletin on blueberries in 1910.

Mr. Carleton talks with County Agent Tomlinson, Barnstable, Massachusetts.

Practically all of the modern blueberries trace their ancestry back to a wild berry found at Greenfield, New Hampshire, in July 1908 and named the Brooks after the owner of the pasture where this wild berry was first discovered. The second wild berry which was selected for breeding was also found in New Hampshire on the 600-acre farm of Frank Russell and named after the owner. The Russell discovered in 1909 has an early-bearing tendency and all of the varieties developed from this wild plant are noted for their early-bearing habit.

In searching for a wild blueberry to use in breeding purposes, one of the

stipulations was that it should measure at least half an inch in diameter. Seedlings that proved hard to pick, those berries with a large scar where the berry separates from the stem, and those where the skin at the base of the berry tends to remain attached to the stem were discarded as undesirable parents.

The keeping quality and firmness of flesh were also considered important, as well as the size of the calyx—a berry with a large calyx was discarded as this large calyx provided a place for the insects to hide.

Some varieties have a tendency to crack after a rain either between the lobes or at the middle of the berry. This fault has eliminated several varieties which were desirable except for this one characteristic. Flavor is another very important factor in the ideal berry. As evidence that the Department was looking after the interests of the consumer as well as the producer, it may be told that more than 300 seedling blueberry plants that bore berries over three-quarters of an inch (19.1mm) in diameter were destroyed because they did not come up to the standards set by Dr. Scoville and his associates in the Department of Agriculture.

Some of the popular varieties include the Pioneer which is a cross between the Brooks and the Sooy (a wild berry found in New Jersey) and introduced to the public in 1912. The Cabot, offered to growers in 1915, is a cross between the Brooks and another wild berry named the Chatsworth. In 1917 the Concord was introduced and is a cross between the Brooks and the Rubel. The Rancocas, a cross between a hybrid and the Rubel, was offered for sale in the same year. It will be noticed, as mentioned earlier, that all of the above varieties have the "blood" of the Brooks —the first wild berry selected for breeding purposes.

Most of the older plants or bushes on the Carleton plantations are set 6 x 6 feet, but later plantings will be set either 8 x 7 or 8 x 8 feet as Mr. Carleton feels that this wider spacing allows more sunlight to hit the plants and also allows a better flow of air around the bushes. With plants set 6 x 6 feet it takes about 1,300 to set an acre.

Although Mr. Carleton practices clean cultivation in the main, he prefers the mulch system. With mulching material costing from $6 to $8 per ton and from 8 to 10 tons needed per acre, this practice is more expensive, possibly, than clean cultivation. Mulching, however, aids in conserving moisture and eliminates the operation of cultivation which in itself is expensive.

Recommended Fertilizer Analysis

Although experiments with fertilizer on blueberries have been conducted for years, the "ideal" mixture has not as yet been discovered. The work along this line at the New Jersey Experiment Station has been noteworthy and the late Dr. Beckwith after his experiments recommended something like a 7-7-7 analysis. Growers of blueberries in New Jersey have followed this advice and Mr. Carleton also applies a 7-7-7 fertilizer to all of his plantations. Incidentally this is the analysis that cranberry growers on the Cape—with its 12,000 acres in cranberries—applied to their bogs this year. The amount varies but usually from 500 to 800 pounds per acre are applied in May, followed in some cases by an application of nitrogen later in the season.

Blueberries prefer an acid soil. A sandy or peaty loam with the water table about 2 feet from the surface seems to be almost ideal but they will grow and thrive when the water table is 5 to 10 feet below the surface. In many sections where ideal moisture conditions do not exist, growers have found that they must mulch their bushes in order to get the proper growth and a profitable yield.

An average yield is 2 quarts per bush but yields as high as 6 to 8 quarts per bush are not uncommon. Pickers on Mr. Carleton's plantations are paid 10 cents per quart and at this rate they can make a real daily wage. He sells his berries usually for 40 cents per pint

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California Fertilizer Usage

By Weller Noble

Berkeley, California

THE requirement of the War Food Administration for securing of applications from consumers for fertilizers showing acreage and kinds and quantities of fertilizers to be used, for the purpose of more equitably distributing fertilizers during the war era, offered such valuable information for statistical purposes that the Fertilizer Industry in California agreed to forward copies of these applications to the State Department of Agriculture so that they could be properly segregated and tabulated.

Statistical data compiled from applications for fertilizer for the year 1943 are enlightening. The data are segregated in six months periods. The figures for the first six months of 1943 represent 99% of the total fertilizers sold in California, but due to the delay in reports, the last six months' figures prepared represent but 48% of the total tonnage. The data on usage are not materially altered, however, because of the fact that complete returns were not forwarded to the Department of Agriculture in sufficient time for inclusion in the 1944 report of the Department.

The complete data are published by the Department of Agriculture in Bulletin 208. If approximately double the acreage and tonnage is taken for the last six months of 1943, a fairly accurate picture is shown.

These figures are the first ever published with any authenticity with respect to acreages fertilized in California. It is quite illuminating in outlining these data to break down the use of the plant food applied to the soils for various crops into actual percentages of nitrogen (N), phosphoric acid (P_2O_5), and potash (K_2O).

Use of Fertilizer January Through June 1943

The soils on which fertilizer was applied amounted to 1,036,316 acres. Usage is divided as follows:

	Acres	*% of Total*
Vegetables	415,588	40.1
Tree Crops, other than citrus	86,618	8.3
Citrus	152,095	14.7
Miscellaneous Crops	260,298	25.1
Grapes & Berries	36,876	3.5
Grain & Forage Crops	45,369	4.4
Ornamental & Condiment Crops	5,068	.5
Crops not segregated	34,404	3.3

Figures shown are the percentage of each plant food used for various crops in relation to the total plant-food units applied in this period.

Total Fertilizer Tonnage

The total of tons of fertilizers applied amounts to 156,325 tons, or in terms of the three plant-food elements to:

	Tons	*% of Total*
Nitrogen (N)	20,736	58.3
Phosphoric Acid (P_2O_5)	10,081	28.4
Potash (K_2O)	4,712	13.3

From the above figures it will be noted that for the spring of 1943, 58.3% of the plant food used in the production of California crops was nitrogen, and 41.7% phosphoric acid and potash.

The application of these plant-food elements on the various crops is shown percentagewise and is calculated in relation to the total of each element used.

The percentage of the total quantities of nitrogen, phosphoric acid, and potash

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Potash Deficiency Follows Continuous Wheat

By N. C. Smith and Wm. A. Albrecht

Department of Soils, University of Missouri, Columbia, Missouri

Annual applications of potassium on the right half of the plot established sweet clover (upper photo) and this crop failed on the left where only biennial applications were made. The corn crop given potassium along with this green manure showed the effects of this combination of treatments by an increased yield of 19 bushels. Spring and summer views 1944.

SUCCESSFUL growth of sweet clover, in contrast to its complete failure, and thereby an increase of 19 bushels of corn per acre resulted on Sanborn Field [1] in 1944 from the use of potash annually rather than biennially.

On one of the plots of this old experiment field, wheat had been grown continuously for 50 years. During the

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[1] Sanborn Field of the Missouri Agricultural Experiment Station at Columbia, Missouri.

Poor Soils—Poor People

By Lester L. Loftin

Soil Conservation Service, Fort Worth, Texas

THE United States produces more food than any other nation in the world, yet according to Dr. Thomas Parran, Jr., U. S. Surgeon General, 40 per cent of the population suffers from malnutrition. How can this be true? The majority of the people get enough to eat. Evidently the food eaten does not have enough of the right minerals and vitamins in it to keep them healthy. What causes food to lack these necessary elements?

Investigators have found that food is no richer in minerals than the soil from which it comes. Depleted soils will not produce healthy and nutritious plants. Plants suffering from mineral deficiencies will not nourish healthy animals. Mineral-deficient plants and undernourished animals will not support our people in health. Poor soils perpetuate poor people physically, mentally, and financially.

Unfortunately, many of this nation's soils are deficient in one or more of the necessary elements for proper plant and animal life. This is especially true of the Southern states where most of the soils, in addition to being inherently low in fertility, have suffered erosion and depletion through cropping.

It is said that armies march on their stomachs. It might be added that stomachs march according to the fertility of the soil. Leonard C. Rountree, Chief of the Medical Division of the Selective Service, reports that health belts exist in the United States. These health belts vary in general according to the fertility of the soil. Seven out of every ten men examined in Colorado, where the soils are predominantly fer-

Fig. 1. Soils with ample minerals have produced this stand of Bermuda and lespedeza on this four-year-old Arkansas pasture. Cattle grazing on it make good gains and produce a good grade of beef and milk. The few bare spots have been vegetated since the picture was made.

tile, were physically fit for military service; while in some of the Southern states, where the soils are predominantly poor and depleted, only three out of every ten were physically fit.

The soil is most likely to become deficient in nitrogen, phosphorus, potassium, and calcium, nevertheless any of the other required elements may also become deficient.

The human body requires 12 major elements and a number of trace elements to function properly. Take away any single one of these elements and life cannot exist. Investigators have demonstrated that the quantitative variations of such inorganic elements as calcium, phosphorus, iodine, copper, cobalt, and iron in foods and feeds are very important factors in human and animal health. It is known that when soils of an area lack iodine, the people living in that area do not receive enough in the locally grown food and, therefore, suffer a high incidence of goiter. It was found in certain districts in Florida, where the predominant soils were classed as deficient in iron, copper, and cobalt, that from 52 to 96 per cent of the children were anemic, but in the districts where the predominant soils were found to contain sufficient amounts of these elements, that less than 25 per cent were anemic. Dietary deficiencies are rarely single and specific in effect as in the case of goiter and anemia, but cover a wide range of disturbed body functions that we ordinarily overlook and do not think of as being caused by the mineral deficiencies of our soils.

Calcium and phosphorus deficiencies readily show up in livestock. In some localities animals born in the early winter develop rickets by late winter or early spring because of mineral deficiencies. In the southwestern part of Louisiana cows suffer with what farmers commonly call the "hollow horn and hollow tail" disease. Cows suffering this deficiency cannot get sufficient minerals from their grazing grasses to develop their bones. In the development of their offspring, they have to draw so heavily on the minerals of their own bodies that the bones in their horns and tails are almost completely used up.

Recent experiments have proven that tonnage or bushel yields do not necessarily mean as much as originally believed. Tomatoes grown on soil of high fertility were found to have a nutrient content several times higher than the same variety of tomatoes grown on poor soils. Cows fed a good grade of alfalfa hay are known to produce milk with five times as much Vitamin A as the same cows when fed ordinary hay. It is possible to vary the calcium content of lettuce as much as 60-fold by varying the calcium content of the soil in which it is grown. The calcium content of cabbage, one of the most commonly used protective foods of the vegetable class, has been found to vary from .4 per cent to 1.6 per cent of its dry weight.

Crop Juggling Not A Cure-all

Crop juggling is no permanent substitute for soil deficiencies. New plants that will produce better growth on mineral-deficient soil can be brought in, but the analyses of these plants show that they too are deficient in the same minerals as the soil on which they are grown.

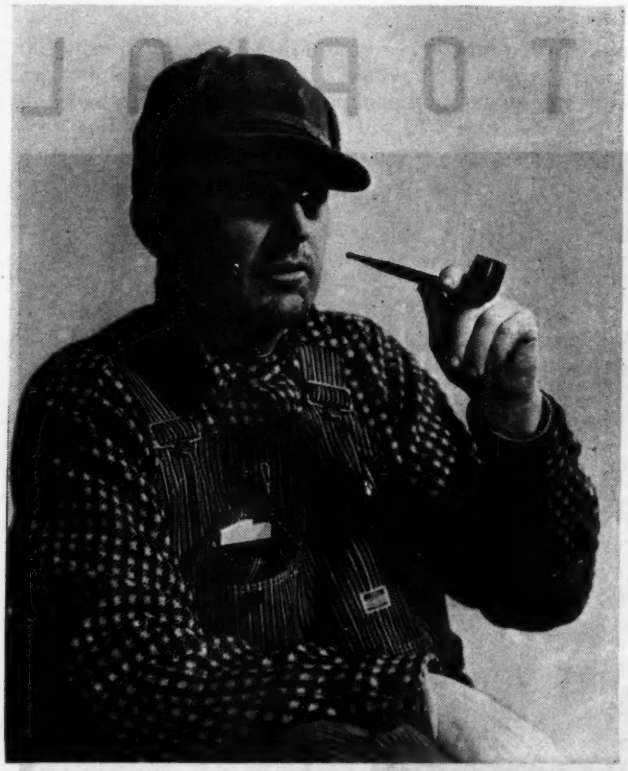
Grains are more stable in nutrient composition than forage plants and they reflect declining soil fertility by declining yields in bushels per acre. Most forage plants tolerate extreme ranges in soil fertility and will make a fair growth on poor soils; therefore, there is a natural tendency for farmers to grow forage crops on poor soils with the illusion that their feed and soil problems are being solved.

According to surveys and experiments the battle to conserve soil is at the present still being lost. Dr. H. H. Bennett, Chief of the U. S. Department of Agriculture Soil Conservation Service, says: "Perhaps 100,000,000 acres of land in the U. S. have been so washed and dried and gullied that they can never be used except for pasturage and forest. Another 100,000,000 acres have been reduced in productive capacity but can be saved in whole or part. This leaves

(*Turn to page* 44)

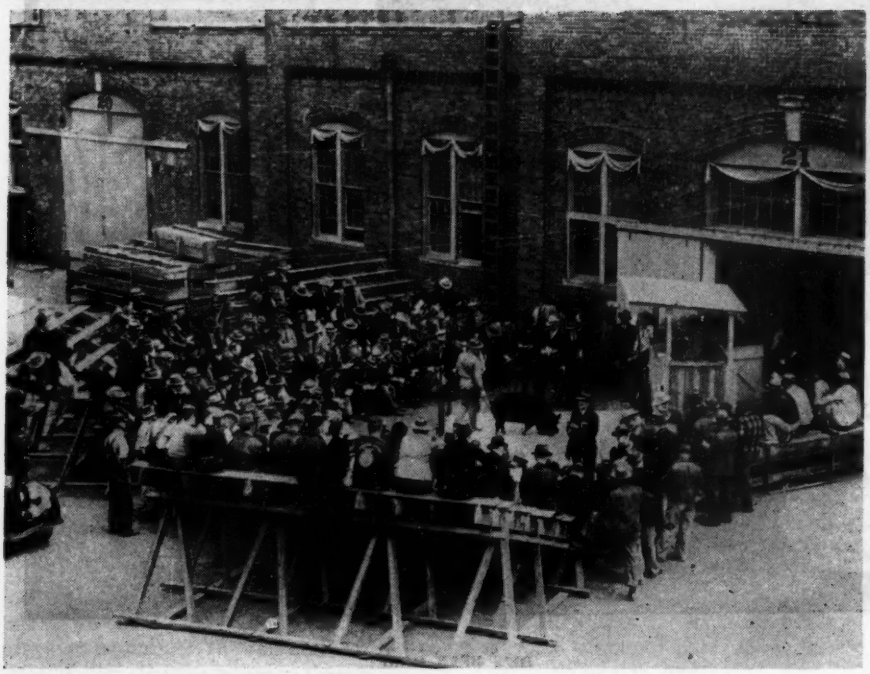
PICTORIAL

HE'S BEEN HERE!



Left: Postwar Thinking

Below: Reserved Seats



Above: Livestock Day

Right: Full Attention

Above: Garlanded in the manner of the South.

Below: Shorn to meet the rigors of the North.

The Editors Talk

Agriculture 1945

Another year is drawing to its close and with it the ending of the most devastating war known to mankind. In reviewing the year for American agriculture, it is with no sense of boastfulness but rather with pride and satisfaction of the resourcefulness of the American farmer that the following situations are reported. Each war-year beginning found him with unprecedented goals to meet; and each year's ending recorded his fulfillment of these goals despite untold difficulties. He can now contemplate the Allied victory with the knowledge that he performed well all that was expected of him.

Early in 1945 and through most of the planting season, over large areas unfavorable weather took the lead in the hazards to be overcome. Late frosts, floods, and continuous rains caused considerable worry not only among agricultural authorities but people all over the world, since with European production far below normal and domestic requirements greatly increased, North America held the key to feeding the world. Farmers were beset with other problems during the season in the form of ever-aging equipment, shortage of man power, lack of experienced labor, inadequate fertilizer and other supplies, and transportation difficulties. Notwithstanding, the reports coming in indicate that the production of nearly every important class of crops will be near or above previous records.

According to the October crop report of the U. S. Department of Agriculture, aggregate total crop production this year promises an output equal to that produced in either of the exceptional years of 1942 and 1944. The total is expected to exceed production in the big year of 1943 by about 6% and the 1923-32 "predrought" average by 24%. Food grain production is the largest and feed production the second largest on record. The fourth successive 3-billion bushel corn crop is in prospect.

Total farm production of livestock and livestock products in 1945 seems to be about the same as the aggregate volume produced last year, but about 5% below the all-time high in 1943. Production is expected to be the second or third largest volume on record. Based on the size of the 1945 crops of pigs, lambs, and calves, the number of chicks and turkeys hatched, and marketing weights for meat animals and poultry, farm production of cattle, hogs, sheep, and poultry for the current calendar year should approximate 45 billion pounds live weight. This total would be about 6 billion pounds below the record output of 1943, slightly less than production in 1944 or 1942, but substantially larger than in any other year. Milk production promises to establish a new record. With production per cow at or near the highest level ever attained, the total volume for the year seems likely to hit 123 billion pounds.

Oats, tobacco, and potatoes made record yields *per acre* this year; and all crops with but four exceptions—peanuts, dry beans, buckwheat, and broom corn—are yielding above average. The first 2 billion-pound tobacco crop ever produced is mostly in the curing barns or in market channels. The composite yield of 28

crops is 131% of the 1923-32 "predrought" average and has been exceeded in only two other years, in 1942 when the index was 136% and 1944 when it was 133%. Acreage of crops harvested this year is expected to be the second largest since 1932.

The year has seen VE and VJ with consequent shiftings in demand from the military to civilian outlets. Many had felt that this might result in agricultural surpluses developing, but there is no indication of such a situation so far. Due to the hard work and ingenuity of North American farmers, we did not suffer any severe or real hardships through lack of food even though the demand was much greater than the supplies available. This demand stepped in to take up the slack when the military requirements were reduced and even changed many items, which at one time looked as though they would drag on the market, to the almost impossible to obtain.

Concomitant with high production were, with few exceptions, good prices. This has resulted in an estimated total farm income of around 23.4 billion dollars—about 3.1% above last year and the highest on record. Farmers have ended in excellent financial condition, with the farm mortgage debt the smallest in 30 years and savings the largest in history. They have wisely used their funds to reduce indebtedness and most of them, being on a cash basis, have been able to take advantage of cash discounts on their purchases. With their improved capital situation and increased consciousness of the necessity of maintaining and building up the fertility of their soil as a basic asset, those fortunate enough to find the materials invested in fertilizers. They undoubtedly would have gone further along these lines if more fertilizers had been available.

And so with the year's closing, Agriculture perhaps finds itself with less reconversion problems and a greater confidence in its ability to meet these problems than any of our other great industries. Certainly none of the other industries has come through the trying war period with a more impressive record.

Farm Prices of Farm Products*

	Cotton Cents per lb.	Tobacco Cents per lb.	Potatoes Cents per bu.	Sweet Potatoes Cents per bu.	Corn Cents per bu.	Wheat Cents per bu.	Hay Dollars per ton	Cottonseed Dollars per ton	Truck Crops
1910–14 Average	12.4	10.4	69.6	87.6	64.8	88.0	11.94	21.59	....
1920	32.1	17.3	249.5	175.7	144.2	224.1	21.26	51.73	....
1921	12.3	19.5	103.8	118.7	58.7	119.0	12.96	22.18	....
1922	18.9	22.8	96.7	104.8	58.5	103.2	11.68	35.04	....
1923	26.7	19.0	84.1	104.4	80.1	98.9	12.29	43.69	....
1924	27.6	19.0	87.0	137.0	91.2	110.5	13.28	38.34	....
1925	22.1	16.8	113.9	171.6	99.9	151.0	12.54	35.07	....
1926	15.1	17.9	185.7	156.3	69.9	135.1	13.06	27.20	....
1927	15.9	20.7	132.3	114.0	78.8	120.5	12.00	28.56	....
1928	18.6	20.0	82.9	112.3	89.1	113.4	10.63	37.70	....
1929	17.7	18.6	93.7	118.4	87.6	102.7	11.56	34.98	....
1930	12.4	12.9	124.4	115.8	78.0	80.9	11.31	26.25	....
1931	7.6	8.2	72.7	92.9	49.8	48.8	9.76	17.04	....
1932	5.8	10.5	43.3	57.2	28.1	38.8	7.53	9.74	....
1933	8.1	12.9	66.0	59.4	36.5	58.1	6.81	12.32	....
1934	12.0	17.1	68.0	79.1	61.3	79.8	10.67	26.12	....
1935	11.6	16.1	49.4	73.9	77.4	86.4	10.57	35.56	....
1936	11.7	17.2	99.6	85.3	76.7	96.0	8.93	31.78	....
1937	11.1	19.9	88.3	91.8	94.8	107.1	10.36	30.24	....
1938	8.3	17.2	55.5	76.9	49.0	66.1	7.55	21.13	....
1939	8.7	15.4	68.1	75.4	47.6	63.6	6.95	22.17	....
1940	9.6	16.0	70.7	85.2	59.0	73.9	7.62	24.31	....
1941	13.3	26.4	64.6	94.4	64.3	84.0	8.10	35.04	....
1942	18.51	36.9	110.0	108.3	79.5	101.8	10.05	44.42	....
1943	19.84	40.5	149.2	196.7	102.7	127.3	12.82	48.26	....
1944	20.39	41.8	141.0	213.5	133.3	142.8	15.43	52.80	....
November	20.78	45.1	143.0	164.0	106.0	143.0	15.60	53.40	....
December	20.85	43.5	150.0	175.0	106.0	145.0	16.50	53.10	....
1945									
January	20.20	41.9	158.0	190.0	107.0	146.0	17.10	52.80	....
February	19.99	31.8	165.0	201.0	106.0	147.0	17.70	52.70	....
March	20.24	21.4	171.0	207.0	107.0	148.0	18.10	52.00	....
April	20.20	21.4	174.0	211.0	107.0	149.0	16.90	51.90	....
May	20.51	42.2	177.0	214.0	108.0	149.0	16.50	52.10	....
June	20.90	51.2	180.0	220.0	111.0	150.0	15.90	52.50	....
July	21.25	56.3	183.0	230.0	112.0	146.0	15.40	55.00	....
August	21.33	44.9	167.0	256.0	113.0	145.0	14.60	52.50	....
September	21.72	43.2	138.0	207.0	112.0	145.0	14.30	51.40	....
October	22.30	45.9	126.0	180.0	113.0	151.0	14.30	51.00	....
November	22.52	46.7	131.0	186.0	111.0	153.0	14.90	51.30	....

Index Numbers (1910-14 = 100)

1920	259	166	358	201	223	255	178	240	....
1921	99	187	149	136	91	135	109	103	....
1922	152	219	139	120	90	117	98	162	....
1923	215	183	121	119	124	112	103	202	....
1924	223	183	125	156	141	126	111	177	159
1925	178	161	164	196	154	172	105	162	153
1926	122	172	267	178	108	154	109	126	143
1927	128	199	190	130	122	137	101	132	121
1928	150	192	119	128	138	129	89	174	159
1929	143	179	135	135	135	117	97	162	149
1930	100	124	179	132	120	92	95	122	140
1931	61	79	104	106	77	55	82	79	117
1932	47	101	62	65	43	44	63	45	102
1933	65	124	95	68	56	66	57	57	105
1934	97	164	98	90	95	91	89	121	104
1935	94	155	71	84	119	98	89	165	126
1936	94	165	143	97	118	109	75	147	113
1937	90	191	127	105	146	122	87	140	122
1938	67	165	80	88	76	75	63	98	101
1939	70	148	98	86	73	72	58	103	109
1940	78	154	102	97	91	84	64	126	121
1941	107	254	93	108	99	95	68	162	145
1942	149	355	158	124	123	116	84	206	199
1943	160	389	214	225	158	145	107	224	245
1944	165	402	203	244	175	162	129	245	217
November	168	434	205	187	164	163	131	247	188
December	168	418	216	200	164	165	138	246	228
1945									
January	163	403	227	217	165	166	143	245	262
February	161	306	237	229	164	167	148	244	223
March	163	206	246	236	165	168	152	241	203
April	163	206	250	241	165	169	142	240	259
May	165	406	254	244	167	169	138	241	193
June	169	492	259	251	171	170	133	243	269
July	171	541	263	263	173	166	129	255	244
August	172	432	240	292	174	165	122	243	240
September	175	415	198	236	173	165	120	238	159
October	180	441	181	205	174	172	120	236	181
November	182	449	188	212	171	174	125	238	235

Wholesale Prices of Ammoniates

	Nitrate of soda per unit N bulk	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory, bulk per unit N	Fish scrap, wet acidulated 6% ammonia, 3% bone phosphate, f.o.b. factory, bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16–17% ammonia Chicago, bulk, per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.05	$3.37	$3.52
1922	3.04	2.58	6.07	4.66	3.54	4.75	4.99
1923	3.02	2.90	6.19	4.83	4.25	4.59	5.16
1924	2.99	2.44	5.87	5.02	4.41	3.60	4.25
1925	3.11	2.47	5.41	5.34	4.70	3.97	4.75
1926	3.06	2.41	4.40	4.95	4.15	4.36	4.90
1927	3.01	2.26	5.07	5.87	4.35	4.32	5.70
1928	2.67	2.30	7.06	6.63	5.28	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.69	4.61	5.72
1930	2.47	1.81	4.78	4.96	4.15	3.79	4.58
1931	2.34	1.46	3.10	3.95	3.33	2.11	.46
1932	1.87	1.04	2.18	2.18	1.82	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.58	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.84	2.67	3.27
1935	1.47	1.15	4.59	3.10	2.65	3.06	3.65
1936	1.53	1.23	4.17	3.42	2.67	3.58	4.25
1937	1.63	1.32	4.91	4.66	3.65	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.17	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.12	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.35	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.27	3.76	4.43
1942	1.74	1.41	6.11	5.77	3.34	5.04	6.76
1943	1.75	1.42	6.30	5.77	3.34	4.86	6.62
1944	1.75	1.42	7.68	5.77	3.34	4.86	6.71
November	1.75	1.42	7.81	5.77	3.34	4.86	6.71
December	1.75	1.42	7.81	5.77	3.34	4.86	6.71
1945							
January	1.75	1.42	7.81	5.77	3.34	4.86	6.71
February	1.75	1.42	7.81	5.77	3.34	4.86	6.71
March	1.75	1.42	7.81	5.77	3.34	4.86	6.71
April	1.75	1.42	7.81	5.77	3.34	4.86	6.71
May	1.75	1.42	7.81	5.77	3.34	4.86	6.71
June	1.75	1.42	7.81	5.77	3.34	4.86	6.71
July	1.75	1.42	7.81	5.77	3.34	4.86	6.71
August	1.75	1.42	7.81	5.77	3.34	4.86	6.71
September	1.75	1.42	7.81	5.77	3.34	4.86	6.71
October	1.75	1.42	7.81	5.77	3.34	4.86	6.71
November	1.75	1.42	7.81	5.77	3.34	4.86	6.71

Index Numbers (1910-14 = 100)

1922	113	90	173	132	117	140	142
1923	112	102	177	137	140	136	147
1924	111	86	168	142	145	107	121
1925	115	87	155	151	155	117	135
1926	113	84	126	140	146	129	139
1927	112	79	145	166	143	128	162
1938	100	81	202	188	173	146	170
1929	96	72	161	142	154	137	162
1930	92	64	137	141	136	12	130
1931	88	51	89	112	109	63	70
1932	71	36	62	62	60	36	39
1933	59	39	84	81	85	97	71
1934	59	42	127	89	93	79	93
1935	57	40	131	88	87	91	104
1936	59	43	119	97	89	106	131
1937	61	46	140	132	120	120	122
1938	63	48	105	106	104	93	100
1939	63	47	115	125	102	115	111
1940	63	48	133	124	110	99	96
1941	63	49	157	151	107	112	126
1942	65	49	175	163	110	150	192
1943	65	50	180	163	110	144	189
1944	65	50	219	163	110	144	191
November	65	50	223	163	110	144	191
December	65	50	223	163	110	144	191
1945							
January	65	50	223	163	110	144	191
February	65	50	223	163	110	144	191
March	65	50	223	163	110	144	191
April	65	50	223	163	110	144	191
May	65	50	223	163	110	144	191
June	65	50	223	163	110	144	191
July	65	50	223	163	110	144	191
August	65	50	223	163	110	144	191
September	65	50	223	163	110	144	191
October	65	50	223	163	110	144	191
November	65	50	223	163	110	144	191

Wholesale Prices of Phosphates and Potash**

	Superphosphate Baltimore, per unit	Florida land pebble 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports[1]	Kainit, 20% bulk, per unit, c.i.f. Atlantic and Gulf ports
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657	$0.655
1922	.566	3.12	6.90	.632	.904	23.87	....	.508
1923	.550	3.08	7.50	.588	.836	23.32	....	.474
1924	.502	2.31	6.60	.582	.860	23.72	....	.472
1925	.600	2.44	6.16	.584	.860	23.72	....	.483
1926	.598	3.20	5.57	.596	.854	23.58	.537	.524
1927	.525	3.09	5.50	.646	.924	25.55	.586	.581
1928	.580	3.12	5.50	.669	.957	26.46	.607	.602
1929	.609	3.18	5.50	.672	.962	26.59	.610	.605
1930	.542	3.18	5.50	.681	.973	26.92	.618	.612
1931	.485	3.18	5.50	.681	.973	26.92	.618	.612
1932	.458	3.18	5.50	.681	.963	26.90	.618	.591
1933	.434	3.11	5.50	.662	.864	25.10	.601	.565
1934	.487	3.14	5.67	.486	.751	22.49	.483	.471
1935	.492	3.30	5.69	.415	.684	21.44	.444	.488
1936	.476	1.85	5.50	.464	.708	22.94	.505	.560
1937	.510	1.85	5.50	.508	.757	24.70	.556	.607
1938	.492	1.85	5.50	.523	.774	15.17	.572	.623
1939	.478	1.90	5.50	.521	.751	24.52	.570	.670
1940	.516	1.90	5.50	.517	.730	24.75	.573	....
1941	.547	1.94	5.64	.522	.780	25.55	.570	....
1942	.600	2.13	6.29	.522	.810	25.74	.205	....
1943	.631	2.00	5.93	.522	.786	25.35	.195	....
1944	.645	2.10	6.10	.522	.777	25.35	.195	....
November	.650	2.20	6.10	.535	.797	26.00	.200	....
December	.650	2.20	6.10	.535	.797	26.00	.200	....
1945								
January	.650	2.20	6.10	.535	.797	26.00	.200	....
February	.650	2.20	6.13	.535	.797	26.00	.200	....
March	.650	2.20	6.20	.535	.797	26.00	.200	....
April	.650	2.20	6.20	.535	.797	26.00	.200	....
May	.650	2.20	6.20	.535	.797	26.00	.200	....
June	.650	2.20	6.20	.471	.701	22.88	.176	....
July	.650	2.20	6.20	.503	.749	24.44	.188	....
August	.650	2.20	6.20	.503	.749	24.44	.188	....
September	.650	2.20	6.20	.503	.749	24.44	.188	....
October	.650	2.20	6.28	.535	.797	26.00	.200	....
November	.650	2.20	6.40	.535	.797	26.00	.200	....
Index Numbers (1910-14 = 100)								
1922	106	87	141	89	95	99	....	78
1923	103	85	154	82	88	96	....	72
1924	94	64	135	82	90	98	....	72
1925	110	68	126	82	90	98	....	74
1926	112	88	114	83	90	98	82	80
1927	100	86	113	90	97	106	89	89
1928	108	86	113	94	100	109	92	92
1929	114	88	113	94	101	110	93	92
1930	101	88	113	95	102	111	94	93
1931	90	88	113	95	102	111	94	93
1932	85	88	113	95	101	111	94	90
1933	81	86	113	93	91	104	91	86
1934	91	87	110	68	79	93	74	72
1935	92	91	117	58	72	89	68	75
1936	89	51	113	65	74	95	77	85
1937	95	51	113	71	79	102	85	93
1938	92	51	113	73	81	104	87	95
1939	89	53	113	73	79	101	87	93
1940	96	53	113	72	77	102	87	....
1941	102	54	110	73	82	106	87	....
1942	112	59	129	73	85	106	84	....
1943	117	55	121	73	82	105	83	....
1944	120	58	125	73	82	105	83	....
November	121	61	125	75	84	108	83	....
December	121	61	125	75	84	108	83	....
1945								
January	121	61	125	75	84	108	83	....
February	121	61	126	75	84	108	83	....
March	121	61	127	75	84	108	83	....
April	121	61	127	75	84	108	83	....
May	121	61	127	75	84	108	83	....
June	121	61	127	66	74	95	80	....
July	121	61	127	70	79	101	82	....
August	121	61	127	70	79	101	82	....
September	121	61	127	70	79	101	82	....
October	121	61	129	75	84	108	83	....
November	121	61	131	75	84	108	83	....

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer materials‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash
1922.....	132	149	141	116	101	145	106	85
1923.....	143	152	147	114	107	144	103	79
1924.....	143	152	143	103	97	125	94	79
1925.....	156	156	151	112	100	131	109	80
1926.....	146	155	146	119	94	135	112	86
1927.....	142	153	139	116	89	150	100	94
1928.....	151	155	141	121	87	177	108	97
1929.....	149	154	139	114	79	146	114	97
1930.....	128	146	126	105	72	131	101	99
1931.....	90	126	107	83	62	83	90	99
1932.....	68	108	95	71	46	48	85	99
1933.....	72	108	96	70	45	71	81	95
1934.....	90	122	109	72	47	90	91	72
1935.....	109	125	117	70	45	97	92	63
1936.....	114	124	118	73	47	107	89	69
1937.....	122	131	126	81	50	129	95	75
1938.....	97	123	115	78	52	101	92	77
1939.....	95	121	112	79	51	119	89	77
1940.....	100	122	115	80	52	114	96	77
1941.....	124	131	127	86	56	130	102	77
1942.....	159	152	144	93	57	161	112	77
1943.....	192	167	150	94	57	160	117	77
1944.....	195	176	151	96	57	174	120	76
November.	196	177	152	97	57	175	121	78
December..	200	178	152	97	57	175	121	78
1945								
January...	201	179	153	97	57	175	121	78
February..	199	179	153	97	57	175	121	78
March.....	198	180	153	97	57	175	121	78
April.....	203	180	154	97	57	175	121	78
May.....	200	180	154	97	57	175	121	78
June.....	206	180	155	95	57	175	121	69
July.....	206	180	154	96	57	175	121	74
August....	204	180	154	96	57	175	121	74
September.	197	181	153	96	57	175	121	74
October...	199	182	154	97	57	175	121	78
November.	205	182	155	97	57	175	121	78

* U. S. D. A. figures.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] **Beginning with June 1941, manure salts prices are F. O. B. mines, the only basis now quoted.**

** **The annual average of potash prices is higher than the weighted average of prices actually paid because since 1926 better than 90% of the potash used in agriculture has been contracted for during the discount period. From 1937 on, the maximum seasonal discount has been 12%.**

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"The Influence of Nitrogen Nutrition of the Tree Upon the Ascorbic Acid Content and Other Chemical and Physical Characteristics of Grapefruit," Agr. Exp. Sta., Univ. of Ariz., Tucson, Ariz., T. Bul. 106, Jan. 1945, W. W. Jones, C. W. Van Horn, and A. H. Finch.

"Extracts from the Agricultural Code of California Pertaining to General Provisions and Fertilizing Materials," Dept. of Agr., Sacramento, Calif., Rev. Sept. 15, 1945.

"Agricultural Minerals Registrants to Date for the Fiscal Year Ending June 30, 1946," Dept. of Agr., Sacramento, Calif., FM-114, Sept. 28, 1945.

"Commercial Fertilizers Registrants to Date for the Fiscal Year Ending June 30, 1946," Dept. of Agr., Sacramento, Calif., FM-115, Sept. 28, 1945.

"Amendments to the Fertilizing Materials Article," Dept. of Agr., Sacramento, Calif., FM-117, Oct. 18, 1945.

"Fertilizer Materials Used in Florida for Fiscal Year July 1, 1944 Thru June 30, 1945," Fert. Statistical Div., Bu. of Insp., Tallahassee, Fla.

"Fertilizer Recommendations for the Fall of 1945," Agron. Dept., Purdue Univ., Lafayette, Ind.

"Summary of 1944 Plow-Sole Fertilizer Demonstrations," Agron. Dept., Purdue Univ., Lafayette, Ind., Agron. Mimeo. 63, April 1945, George H. Enfield.

"Farm Manure," Agr. Exp. Sta., Mich. State College, East Lansing, Mich., Cir. Bul. 196, June 1945, L. M. Turk and A. G. Weidemann.

"Improvised Methods of Applying Ammonium Nitrate," Ext. Serv., Univ. of Nebr., Lincoln, Nebr., Inf. Ser. 24, June 1945, L. F. Larsen and Walter Fitts.

"Cottonseed Meal as a Fertilizer for Cotton," Agr. Exp. Sta., College of Agr., State College, N. M., P. Bul. 1006, June 29, 1945, A. R. Leding.

"Production, Composition, and Value of Poultry Manure," Agr. Exp. Sta., Pa. State College, State College, Pa., Bul. 469, Nov. 1944, J. W. White, F. J. Holben, and A. C. Richer.

"The Value of Different Phosphates for Various Texas Soils and Grasses, as Indicated by Pot Experiments," Agr. Exp. Sta., College Station, Texas., Bul. 672, July 1945, J. F. Fudge and G. S. Fraps.

"Homemade Fertilizer Spreaders," Ext. Serv., State College, Texas, C-220, 1945, E. E. Rambo.

"1945 Results of Fertilizer Demonstrations on Small Grain and Hay," Soils Dept., Univ. of Wis., Madison, Wis., Aug. 1945, C. J. Chapman.

"Fall Fertilizer for 1946 Seedings," Soils Dept., Univ. of Wis., Madison, Wis., Sept. 1945, C. J. Chapman.

"Nitrogen Fertilizer for Permanent Pasture Proves Profitable," Soils Dept., Univ. of Wis., Madison, Wis., Sept. 1945, C. J. Chapman.

Soils

"Ground Water Supply of Prospect Valley, Colorado," Agr. Exp. Sta., Colo. State College, Fort Collins, Colo., T. Bul. 34, Oct. 1945, W. E. Code.

"Suggestions for Taking Soil Samples for Soil Tests," Agr. Ext. Serv., Univ. of Hawaii, Honolulu, E. Cir. 180 (Replacing Ag. Notes 161), Sept. 1945.

"Soil Conservation Practices for Kentucky Farms," Agr. Ext. Serv., Univ. of Ky., Lexington, Ky., Leaf. 91, June 1945, W. G. Survant.

"Physical and Chemical Properties of Soil Profiles of the Burchard and Steinauer Series," Agr. Exp. Sta., Univ. of Nebr., Lincoln, Nebr., Res. Bul. 139, July 1945, Henry W. Smith and H. F. Rhoades.

"Soil Management as Related to Sugar Beet Production," Dept. of Agron., Agr. Exp. Sta., Wooster, Ohio, Agron. Mimeo. 93, 1944, R. E. Yoder.

"Soil Changes as Influenced by Cropping and Fertilizer Treatment," Agr. Exp. Sta., State College of Agr., Brookings, S. D., T. Bul. 4, March 1945, Leo F. Puhr.

"We Can All Help Save Our Soil," Ext. Serv., Univ. of Wis., Madison, Wis., Cir. 360, June 1945, O. R. Zeasman and J. W. Clark.

"Soil Survey—Calloway County Kentucky," U. S. D. A., Washington, D. C., Series 1937, No. 15, Aug. 1945, W. J. Leighty, H. Wm. Higbee, W. S. Reed, and C. E. Wyatt.

"Soil Survey (Reconnaissance) Linn County Missouri," U. S. D. A., Washington, D. C.,

Series 1938, No. 7, Aug. 1945, W. D. Shrader, M. E. Springer, N. S. Hall, Wm. DeYoung, and H. V. Jordan.

"Soil Survey—Princess Anne County Virginia," U. S. D. A., Washington, D. C., Series 1939, No. 3, July 1945, C. S. Simmons and Edward Shulkcum.

"Soil Survey—Russell County Virginia," U. S. D. A., Washington, D. C., Series 1936, No. 21, July 1945, S. S. Obenshain, H. C. Porter, W. W. Lewis, G. S. Francis, R. C. Turney, A. C. Orvedal, R. E. Devereux, and A. W. Goke.

"Soil and Water Conservation Needs Estimates for the United States," Soil Cons. Serv., U. S. D. A., Washington 25, D. C., Rev. June 1945.

Crops

"Feed and Forage Cropping System for Process Milk Production in the Alabama-Tennessee Valley," Agr. Exp. Sta., Ala. Polytechnic Inst., Auburn, Ala., Mimeo. Ser. 9, Sept. 1944, Fred Stewart and John Boseck.

"Date Production in Arizona," Agr. Ext. Serv., Univ. of Ariz., Tucson, Ariz., Cir. 125, May 1945, H. B. Powers.

"Report for 1943 and 1944," Horticultural Exp. Sta., Vineland, Ont., Canada.

"Pastures for Florida," Agr. Exp. Sta., Univ. of Fla., Gainesville, Fla., Bul. 409, April 1945, R. E. Blaser, W. E. Stokes, J. D. Warner, G. E. Ritchey, and G. B. Killinger

"Planning the Home Garden," Agr. Ext. Serv., Univ. of Hawaii, Honolulu, E. Cir. 178, Sept. 1945, Joseph H. Boyd.

"4-H Club Garden Manual," Agr. Ext. Serv., Purdue Univ., Lafayette, Ind., E. Bul. 227 (2nd Rev.), Dec. 1944, W. B. Ward and W. R. Amick.

"Indiana Soybean Variety Tests 1938-1944," Agr. Exp. Sta., Purdue Univ., Lafayette, Ind., Mimeo. 2, June 1945, A. H. Probst and G. H. Cutler.

"Are Soybeans a Menace to Soil Improvement?" Agr. Ext. Serv., Purdue Univ., Lafayette, Ind., Mimeo. 48, 1945.

"Distance Between Rows and Rate of Seeding Soybeans," Div. of Agron., Purdue Univ., Lafayette, Ind., Mimeo. 54 (Rev.), March 1945, R. R. Mulvey.

"Late Planting of Corn and Soybeans," Div. of Agron., Purdue Univ., Lafayette, Ind., Mimeo. 56, 1945.

"Indiana Summary 1944 Corn Demonstration," Div. of Agron., West Lafayette, Ind., Mimeo. 64, April 1945.

"Mung Beans," Ext. Serv., Purdue Univ., Lafayette, Ind., Agron. 65, 1945.

"Buckwheat," Agr. Ext. Serv., Purdue Univ., Lafayette, Ind., Mimeo. 66, Aug. 1945.

"Yellow Trefoil or Black Medic or None Such," Agr. Ext. Serv., Purdue Univ., Lafayette, Ind., Mimeo. 68, 1945.

"Hay, Cash or Pasture Crops for Delayed Seeding," Div. of Agron., Purdue Univ., Lafayette, Ind., Agron. Mimeo. 69, 1945.

"Vetch," Agr. Ext. Serv., Purdue Univ., Lafayette, Ind., Agron. Mimeo. 70, 1945.

"Annual Report of the Director of Agricultural Extension Kentucky, 1944," Ext. Div., Univ. of Ky., Lexington, Ky., Cir. 405, June 1945, T. R. Bryant.

"Composition and Yield of Kentucky Bluegrass and Korean Lespedeza at Different Stages of Growth," Agr. Exp. Sta., Univ. of Ky., Lexington, Ky., Bul. 473, June 1945, G. Davis Buckner and Amanda H. Henry.

"Michigan State Board of Agriculture 1944," State Board of Agr., Lansing, Mich.

"Taxonomic and Ecological Work on the Higher Plants of Michigan," Agr. Exp. Sta., Mich. State College, East Lansing, Mich., T. Bul. 201, June 1945, H. T. Darlington.

"Annual Report Mississippi Extension Service 1944," Ext. Serv., Miss. State College, State College, Miss., Bul. 133 (1500), June 1945.

"Late Plantings of Vegetables," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., Cir. 302, June 1945, A. D. Hibbard and S. H. Wittwer.

"Johnson Grass as a Weed in Missouri," Agr. Ext. Serv., Univ. of Mo., Columbia, Mo., Cir. 517, May 1945, J. R. Paulling.

"Nebraska Agriculture 1944, 58th Annual Report." Agr. Exp. Sta., Univ. of Nebr., Lincoln, Nebr.

"The Symbiotic Performance of Isolates from Soybean with Species of Crotalaria and Certain Other Plants," Agr. Exp. Sta., Cornell Univ., Ithaca, N. Y., Mem. 267, March 1945, J. K. Wilson.

"The Oklahoma Vegetable Research Station at Bixby Progress Report, 1945," Agr. Exp. Sta., Okla. A. & M. College, Stillwater, Okla., Mimeo. Cir. M-146, June 1945, H. B. Cordner and F. A. Romshe.

"Diseases of Field Crops in Oklahoma," Agr. Exp. Sta., Okla. A. & M. College, Stillwater, Okla., Cir. 119, Oct. 1945.

"Sweet Corn Growing for Market and Manufacture," Fed. Coop. Ext. Serv., Oreg. State College, Corvallis, Oreg., Cir. 448 (Rev. of E. Cir. 344), March 1945, A. G. B. Bouquet.

"Growing Green Peas for Market and Manufacture," Fed. Coop. Ext. Serv., Oreg. State College, Corvallis, Oreg., Cir. 451 (Rev. of E. Cir. 247), March 1945, A. G. B. Bouquet.

"Report of the Federal Experiment Station in Puerto Rico 1944," Fed. Exp. Sta. in P. R., Mayaguez, P. R.

"Mineral Deficiencies in Derris Elliptica," Fed. Exp. Sta. in P. R., Mayaguez, P. R., Bul. 43, July 1945, Rufus H. Moore.

"Some Factors Affecting the Yield and Grade of Green Mountain Potatoes in Rhode Island," Agr. Exp. Sta., R. I. State College, Kingston, R. I., Bul. 297, May 1945, A. E. Rich.

"Studies on Sweet Potato Production in Texas," Agr. Exp. Sta., A. & M. College, College Station, Texas, Bul. 668, April 1945, R. E. Wright.

"Clipping Experiments with Small Grain Varieties, 1944-45, at Winter Haven, Texas," Agr. Exp. Sta., A. & M. College, College Station, Texas, P. R. 950, June 18, 1945, E. Mortenson.

"List of Fruit Varieties Recommended for Utah Orchards and Gardens," Agr. Exp. Sta., Utah State Agr. College, Logan, Utah, Mimeo. Ser. 319, April 1945, F. M. Coe.

"Alfalfa Growing in West Virginia," Ext. Serv., W. Va. Univ., Morgantown, W. Va., Cir. 312 (Rev.), April 1945, R. J. Friant.

"A Forest Conservation Program," U. S. D. A., Washington, D. C., AIS-10, July 1945.

"Sagebrush to Grass," U. S. D. A., Washington, D. C., AIS-27, Aug. 1945.

"Farm Woodland Management in the Western Gulf Region," U. S. D. A., Washington, D. C., AIS-29, Aug. 1945, Homer C. Mitchell.

"Seven Questions to Ask When You Buy or Sell Shelled Corn by Grade," U. S. D. A., Washington, D. C., AIS-32, July 1945.

"Date Culture in the United States," U. S. D. A., Washington, D. C., Cir. 728, Aug. 1945, Roy W. Nixon.

"Three Introduced Lovegrasses for Soil Conservation," U. S. D. A., Washington, D. C., Cir. 730, Aug. 1945, F. J. Crider.

"Poison-ivy, Poison-oak and Poison Sumac," U. S. D. A., Washington, D. C., F. B. 1972, Donald M. Crooks.

"Improvement of the Wild Blueberry," U. S. D. A., Washington, D. C., R. A. S. 44 (P), Sept. 5, 1945.

"One-Variety-Cotton Communities Provide for Superior Cotton Fabrics," U. S. D. A., Washington, D. C., R. A. S. 45 (P), Sept. 14, 1945.

Economics

"Selecting Arizona Settlers," Agr. Exp. Sta., Univ. of Ariz., Tucson, Ariz., Bul. 196, Feb. 1945, E. D. Tetreau.

"What's This Farm Worth?" Agr. Ext. Serv., Univ. System of Ga., Athens, Ga., Cir. 332, June 1945.

"The Rural Land Market in the Northern Idaho Grain-Pea Area," Agr. Exp. Sta., Univ. of Idaho, Moscow, Idaho, Bul. 26, May 1945, A. Norman Nybroten.

"Idaho Employment in Relation to Agriculture," Agr. Exp. Sta., Univ. of Idaho, Moscow, Idaho, Cir. 104, June 1945.

"The Outlook for Indiana Agriculture 1945," Dept. of Agr. Ext., Purdue Univ., Lafayette, Ind., E. Bul. 315, Jan. 1945.

"Maine Farm Prices During World War Periods," Agr. Exp. Sta., Univ. of Me., Orono, Me., Bul. 435, June 1945.

"New Mexico Dry-Farming Areas," Agr. Exp. Sta., N. Mex. College of Agr., State College, N. M., Bul. 320, Jan. 1945, Morris Evans.

"The Delaware County Agricultural Survey," Dept. of Agr. Econ., N. Y. State College of Agr., Ithaca, N. Y., AE 513, Feb. 1945, H. F. DeGraff.

"Costs and Returns from Farm Enterprises," Dept. of Agr. Econ., N. Y. State College of Agr., Ithaca, N. Y., AE 515, April 1945, H. F. DeGraff.

"Farm Account Summary and Comparative Report 1944, Albany, Allegany and Jefferson Counties," Dept. of Agr. Econ., N. Y. State College of Agr. Ithaca, N. Y., AE 518, March 1945, L. C. Cunningham.

"Acreage and Production of Hay on New York Dairy Farms," Dept. of Agr. Econ., Cornell Univ., Ithaca, N. Y., A.E. 526, June 1945.

"The Postwar Economic Outlook in an Agricultural-Industrial Area," Agr. Exp. Sta., Clemson Agr. College, Clemson, S. C., Bul. 355, May 1945, G. H. Aull and J. M. Stepp.

"Harvesting Cotton in the High Plains Area of Texas," Agr. Exp. Sta., A. & M. College, College Station, Texas, P. R. 952, Aug. 1945, Troy Mullins.

"Impact of the War on the Financial Structure of Agriculture," U. S. D. A., Washington, D. C., M. P. 567, Aug. 1945.

"What Peace Can Mean to American Farmers," U. S. D. A., Washington, D. C., M. P. 570, July 1945.

"Agricultural Production and Trade by Countries," U. S. D. A., Washington, D. C., Oct. 1945.

"Postwar Federal Finance and Agriculture," U. S. D. A., Washington, D. C., Aug. 1945, Tyler F. Haygood.

"Farmers' Response to Price in the Production of Potatoes 1922-41," U. S. D. A., Washington, D. C., July 1945, Ben H. Pubols and Saul B. Klaman.

"State Councils and Associations of Farmer Cooperatives," U. S. D. A., Washington, D. C., Mis. Report 82, Jan. 1945, Jane L. Scearce.

She was one of those tender young creatures, and the diffident GI (oh, yes, there are a few) inquired cautiously: "You don't shrink from kissing, do you?"

"Heavens, no," exclaimed the not-too-tender miss, "if I did I'd be all skin and bones."

Two casual golf acquaintances were walking towards the green when they sighted two women coming over the hill.

"Here comes my wife with some old hag she's picked up somewhere," said one.

"And here comes mine with another," retorted his companion icily.

Sweetening from Spuds

The Nation's supply of paints, lacquers, synthetic rubber, motor fuel, and anti-freeze is already benefiting from the diversion of surplus potatoes. The U. S. Department of Agriculture, moreover, is soon to increase the supply of sweetening by sending to ethyl alcohol plants in the Midwest some of the lower grade potatoes and part of this year's bumper crop that the Government is handling to support farm prices.

Diversion of potatoes for the manufacture of butyl alcohol, an ingredient of paints and lacquers and a source of synthetic rubber, is under way at a Philadelphia plant which is using about 75 cars a day of the potatoes from the intermediate crop that the Department purchased in supporting the market. These potatoes will not store well over winter and are being used now to clear the market for the regular storage crop.

A Midwestern ethyl alcohol plant is being converted for the manufacture of glucose as a result of legislation permitting alcohol plants to turn out this kind of sugar. These plants will use substantial quantities of potatoes and should help relieve the sugar shortage. About 15 pounds of glucose syrup—equivalent in sweetening to 7 or 8 pounds of sugar—can be produced from 100 pounds of potatoes. Glucose is used in bakery goods, soft drinks, preserves, jams, and jellies. It is also possible that beet sugar plants will be used to make glucose from potatoes.

The purpose of the diversion program, says the Department, is to prevent wastage of surplus potatoes and to afford fair prices to producers, while at the same time supplying consumers with additional quantities of commodities such as glucose, which are needed.

Efficient Crop Production

(*From page* 8)

was upset, which resulted in depressed yields. Parallel situations may result from excessive applications of other essential fertilizer elements.

Fig. 4. Normal corn plants on a part of the field shown in Fig. 3 which was not limed.

A fertility experiment on Berks silt loam at Staunton, Virginia, was reported by S. S. Obenshain and T. P. Gish in the December 1944 issue of Better Crops With Plant Food under the title of "Lime Is the Key to Potash Efficiency." This title might suggest a conflict between the results of the Virginia experiment and the evidence that lime increases the potash requirement of crops grown on several of the Alabama soils. In the Virginia experiment, the need for lime to grow red clover was the limiting factor in the wheat-clover-corn rotation, and after lime was applied profitable increases in yields were obtained from the addition of all of the fertilizer elements tested. This should not be construed as an indication that where a potash deficiency is limiting crop growth, lime would serve to increase yields by increasing the efficiency of either the native soil or applied potash. There is considerable proof that such is not the case generally, especially with crops of high-potash requirement when grown on soils of low potash-supplying capacity.

The obvious conclusion, as the Virginia agronomists suggested, is that rates of lime should fit the needs of the cropping system and the soil. Then fertilizer treatments may be geared for a higher level of production, in order to maintain the balance of available plant food. When this is done maximum efficiency of crop production is possible.

California Fertilizer Usage

(*From page* 23)

used on various crops indicates fertilizing practices which are of value to California farmers.

	N % *of Total*	P_2O_5 % *of Total*	K_2O % *of Total*
Vegetables	40.1	51.4	55.7
Tree Crops, other than citrus	10.8	5.2	8.0
Citrus	24.8	15.8	19.7
Miscellaneous Crops	15.1	20.7	5.8
Grapes & Berries	2.9	4.2	6.8
Grain & Forage Crops	2.6	.9	.2
Ornamental & Condiment Crops	.6	.9	2.3
Crops not segregated	2.7	.8	1.3

July Through December of 1943

It is regretted that only 48% of the records were available for statistical purposes for the fall months, but general fall fertilizer usage is indicated by these records. If the acreage and fertilizer tonnage are doubled, a fairly accurate figure will be shown. The figures shown below represent only the data shown on applications available when the Department of Agriculture published its report.

Such figures show that 428,643 acres were fertilized in California during the last six months of 1943, outlined as follows:

	Acres	% *of Total*
Vegetables	200,762	46.8
Tree Crops, other than citrus	51,207	11.9
Citrus	57,353	13.4
Miscellaneous Crops	80,264	18.7
Grapes & Berries	16,528	3.9
Grain & ForageCrops	7,162	1.7
Ornamental & Condiment Crops	1,655	.4
Crops not segregated	13,712	3.2

The percentage of plant food used in the production of these crops in relation to the total quantity of each plant food calculated on the basis of the actual elements of nitrogen (N), phosphoric acid (P_2O_5), and potash (K_2O) is as follows:

	N % *of Total*	P_2O_5 % *of Total*	K_2O % *of Total*
Vegetables	51.3	48.5	45.8
Tree Crops, other than citrus	16.5	11.5	20.8
Citrus	20.1	12.1	18.8
Miscellaneous Crops	4.8	21.6	3.3
Grapes & Berries	4.1	4.1	9.7
Grain & Forage	.4	1.1	.2
Ornamental & Condiment Crops	.4	.4	.5
Crops not segregated	2.4	.7	.8

The actual quantities of nitrogen (N), phosphoric acid (P_2O_5), and potash (K_2O) represented as having been used during the last half of 1943 are shown below. It must be borne in mind that about double these quantities were used:

	Tons	*% of Total*
Nitrogen (N)	8,765	52
Phosphoric Acid (P_2O_5)	5,762	34
Potash (K_2O)	2,369	14

Summary

About 1,893,602 acres were fertilized in California during 1943. On these acres, 301,450 tons of fertilizer were applied. The farm value of California crops that year amounted to $1,121,004,000, derived from approximately 6-million crop acres.

The wider distribution of fertilizers and increased yields resulting from their use will be an important factor in adding to the value of California products.

Nitrogen fertilizers are recognized as necessary for most California soils, but it is evident from the above figures that fertilization with phosphoric acid and potash is also desirable and important in farming programs in California.

And Now the Imperative for Agriculture and Industry

(*From page* 10)

newly created wealth. The size of this initial income determines in almost exact measure the self-liquidating employment in the Nation, which in turn limits the size of the national income.

The record of our Nation shows that there is an almost exact correlation between farm income and national income. One dollar of farm income multiplies seven times into national income. One dollar of farm and mine income multiplies into five dollars of national income. With this ratio in existence, it should be self-evident that to reduce either the number of units of farm production or the price per unit will bring every segment of our economy down in direct ratio.

The figures developed by a number of economists show that for every one per cent farm prices drop below the parity price levels, there is a loss of one per cent in farm income and a one per cent loss in national income.

The new policy for agriculture should aim at full production, with 100 per cent parity prices on basic crops and a practical policy for distribution of surpluses. Increased production, if properly handled, with 100 per cent parity prices to the producer, and adequate reserves carried as such, will mean continued and increased incomes for all. Increased incomes in turn will mean increased consumption of all products and a higher standard of living.

There should come out of this war at least one generally accepted idea or principle, and that is that each child and each worker shall be assured of the opportunity for a minimum adequate diet and that means shall be taken to establish food habits that will comprise such diets. Abolishing hunger or partial starvation will go a long way toward checking the unrest among the great masses in the marginal groups and making good citizens of untold millions of people. A comprehensive integrated program of consumption adjustment which will reach all groups in the population that are improperly nourished will be needed. One possible method of transition from emergency to permanent programs is that of using the schools as agencies for providing children with protective foods. Using factories and workshops

in a similar manner may be another. The improved diets would call for an expansion of output of dairy and meat products, and this expansion would call for the use of more acres of land. This State and Nation would then have more of its land in pasture and forage crops. Such a program would greatly improve the fertility of the soil and would contribute in a large way to the soil conservation program.

Farmers have a real stake in a high level of consumption which should be achieved through full employment if possible and with government aid if necessary. The fact that our employable population has been working regularly, most of it at good wages, has been the principal factor in building up a high and mainly profitable demand for the products of the farmer. We have the plants to produce goods at a rate that will afford a rising standard of living for everyone who is willing to work. Our national economy must be expansive, not restrictive, and that condition cannot be had by striving for the highest possible return for the lowest possible output. We can achieve a society in which everyone able and willing to work can find an opportunity to earn a living, to make his contribution, to play his part as a citizen of a progressive, democratic country. We have every reason to expect a total national income of around $120 to $125 billions in terms of 1942 prices. We must deliberately set out to hold the new income level and to push it higher as rapidly as increasing productivity will permit.

Private business can and will do the job of producing a rich variety of goods at reasonable prices. However, private enterprise and government together must act to maintain and increase output and income sufficiently to provide substantially full employment.

As a practical matter, we cannot go back to the production levels of 1940. The Department of Commerce recently estimated that if in 1946 we were to go back to 1940 total production at 1940 hours of labor, there would be 19,000,000 unemployed. There would be a cut of more than 30 per cent from our wartime level of production.

If we attain full production and experience a corresponding increase in the national purchasing power, the Department of Commerce says we would be able to spend 40 per cent more for food (in terms of a varied diet, better qualities, and increased services in connection with processing and distributing food products), 45 per cent more for clothing, 55 per cent more for refrigerators and other electrical equipment, 70 per cent more for household furniture, 90 per cent more for new farm machinery, and 2½ times more for new homes than in 1940.

To Reach These Goals

We need urban development projects, rural rehabilitation, low-cost housing, rural electrification, a rural telephone system, flood control, reforestation, etc. We need a public health program, including expansion of hospital facilities.

In order to reach these goals, we must establish and maintain close cooperation among all groups—business, labor, farmers, and government.

The public expenditures required to rebuild America, to provide needed social services, and to maintain full employment can be provided for out of the enormous income which the full utilization of our rich productive resources (material and human) makes possible. The costs of producing this income are merely payments to ourselves for the work done. There is not—there cannot be—any financing problem that is not manageable under a full employment income.

During the war period we learned to cooperate and work together on a constructive give-and-take basis. We won the war because our soldiers, our sailors, our industrial workers, our leaders of enterprise, our farmers, and our government worked as parts of a team. Our economic future, like the winning of the war, rests in our own hands.

This challenge is as great as the war itself. If we meet it, agriculture and industry will grow and prosper, and we will build a greater America.

Florida's Legume Pastures Depend on Seed Source

(*From page* 13)

although commercial seed sources of annual sweet clover are better adapted to Florida conditions than commercial seed sources of Black Medic. Most commercial strains of Hubam (annual white) have a prolonged period of vegetative growth and grow slowly. Many of these strains bloom sparsely and seed lightly and, thus, volunteer poorly when compared with Florida strains (Fig. 3).

Native Florida and commercial strains of California Bur have been tested. The commercial strains have proved to be as productive as Florida strains, but plants from all strains tested have been very susceptible to anthracnose. This disease kills the stems before the seed matures and makes reseeding almost impossible.

Fig. 3. Second year's volunteer growth of Gainesville strains of Hubam sweet clover, left; of commercial seed source, right.

Poor Soils—Poor People

(*From page* 26)

only 460,000,000 acres of cultivatable land and much of it is being washed away each season." Estimates show that 90 per cent of the conservation job lies ahead—that is, conserving the soil in its present state and building it back to its original condition. The job of correcting the mineral shortages of the soil to a point where national health will be assured also lies ahead.

Soil fertility is the place where this nation can undergird rather than undermine its national health. The soils of this nation are its greatest natural resource and if used wisely its value, its strength, and its productivity are ageless

Fig. 2. Soils depleted of necessary minerals and plant nutrients fail to support enough vegetation to prevent erosion. Cattle trying to graze on it do not get sufficient value from the grass to support them in good condition.

References

Soil, War, and Health—An Editorial Reaffirmation. The Land, Vol. II, No. 4, Spring 1943, pages 277-285.

W. A. Albrecht. *Soil and Livestock.* The Land, Vol. II, No. 4, Spring 1943, pages 298-305.

Oscar Erf. *Soil and Milk.* The Land, Vol. II, No. 4, Spring 1943, pages 317-321.

Jonathan Forman. *The Trace Elements in Nutrition.* The Land, Vol. II, No. 4, Spring 1943, pages 286-290.

W. A. Albrecht. *Soil Fertility and the Human Species.* Chemical and Engineering News, Vol. 21, No. 4, February 1943, pages 221-227.

Thomas Parran, Jr., U. S. Surgeon General. *Nutrition and National Health.* (From Technology Review, June 1940, Vol. XLII, No. 8, Masssachusetts Institute of Technology, Cambridge, Mass.)

Potash Deficiency Follows Continuous Wheat

(*From page* 24)

first 25 years, the soil was given six tons of manure annually. During the last 25 years, it had no treatment.

The cropping system and soil treatments were changed in 1938. This plot now has a two-year rotation of corn and wheat with sweet clover as a green manure before the corn. Limestone at the rate of two tons per acre was applied to the entire plot at the time of change. Superphosphate (20 per cent) at 150 pounds and muriate of potash (48 per cent) at 50 pounds per acre are now used regularly with the wheat. An additional application of 50 pounds of the muriate is given to the right half of the plot with the planting of the corn. Thus potassium is applied annually on the one half and only biennially on the other half of the plot.

The increased yield of the corn is attributed to the successful growth of the sweet clover. This increase is now demonstrating the value of this added plant food in providing the sweet clover as a green manure crop. That this 19-bushel increase is due directly to the influence of the sweet clover and in-

directly to the potash was shown by the border effect, viz., the better growth of the corn in the row adjacent to the right portion of this plot as compared to the remaining corn in the left half. The marked contrast between the corn growth and yield on the two halves was as anticipated when the clover had previously succeeded on the one and failed completely on the other half.[2]

The response of this soil to the application of potash is attributed to its 50 years of production of wheat on this soil, and with no soil treatment during the last 25 years of that time. The removal of the straw as a concentrated carrier of potassium in addition to the removal of the grain has evidently depleted to a very low level the soil's available supply of this plant nutrient. This shortage, normally not recognized as a cause of our declining success with clover, has become evident on this soil as it affects the survival of the sweet clover stand and consequently the yield of the following corn crop.

These data indicate that potassium will require more consideration on soils well supplied with lime and phosphorus, but where clover stands are becoming increasingly hard to obtain. Heretofore lime and phosphate were considered sufficient, and when there was a clover failure the weather was always a common alibi. If we are to use legumes successfully to enrich our soils with extra nitrogen and with extra organic matter, potassium will need to be added on some of our soils.

[2] Sweet clover responds to potash fertilizer. W. A. Albrecht—Better Crops With Plant Food, June 1944.

Success With Blueberries

(*From page* 22)

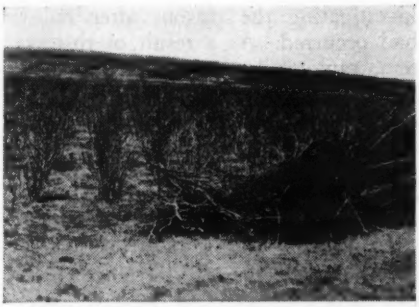
or 75 cents per quart, but years when berries are scarce—such as 1944—the price about doubles and it is impossible to meet the demand. Bushes set 6 x 6 feet would gross about $1 per bush with a 2-quart yield or $1,300 per acre.

Mr. Carleton keeps careful cost accounts and as a result he can tell when and if his plantations return a profit. Expenses are rather high. Pruning will cost about $150 per acre, spraying two times about $25, mulching from $60 to $80 per acre, and harvesting from $250 to $600 per acre depending on the yield. Thus it is clearly evident that blueberry growing is not the road to quick or easy wealth.

It has been said that one cannot transplant a blueberry bush and get a crop the same year, but this Mr. Carleton has disproved. He transplanted many last year and picked a crop from these same bushes.

The blueberry is now propagated from cuttings except in breeding work when in quest of new varieties. The cuttings are taken in the dormant season, usually in very early spring, from one-year-old wood. They remain in the cutting bed for a year and are then transplanted to the nursery row where they remain for another year. The third year they may be set in the field, but the blossoms they bear this year should be picked from the bushes. The following year a pint of berries may be expected per bush and from then on the yield increases each year until it reaches the maximum which depends on the season, the variety, the culture, and the proper pruning. No one knows how long a blueberry bush will bear, but there are plantations which are over 30 years in age and still bearing a good crop.

Mr. Carleton grows all of the best varieties, such as the Rubel, noted for its large yield, the Concord which al-



The above picture shows one of Mr. Carleton's blueberry plantations after pruning.

though a good berry is not a very heavy yielder, the Pioneer which is one of the best of the older varieties. He will set some of the newer varieties now coming onto the market, such as the Atlantic and Pemberton which is named after the town in New Jersey where it originated. The Pemberton, however, has a tendency to tear when picked, that is, the scar tears a little, but this does not decrease its value as a home berry but does decrease its value for storage.

The acreage of blueberries is increasing but slowly due to several factors, mainly to the expense of the plants—a three- to four-year-old plant costing from $2 to $3 at most nurseries. Suitable sites are few and far between and this has a tendency to keep down the acreage. However, a steady increase in acreage may be expected as years pass and more knowledge of the cultural habits of blueberries become known.

Rapid Soil Tests

(*From page* 20)

expected. While optimum weather conditions may help yield a good crop with a soil content appreciably lower than lowest level indicated, it is believed that these limits are suitable under average conditions. In other words, spinach may yield a good crop in some years with only 10 lbs. of soluble phosphorus per acre. However, if more than 15 lbs. are present, there is much better likelihood for it to occur.

Determining Liming Needs

The measurement of pH, while giving the intensity of acidity or alkalinity, does not determine the amount or kind

TABLE 2. PEA YIELD AT SEABROOK FARMS COMPARED WITH OTHER PEA-PRODUCING AREAS

Area	Five-year average	1940	1941	1942	1943	1944	1945
Seabrook Farms	2218	2293	2183	1460*	3114	2038	3362
Penna	1914	2450	2080	1470	1720	1850	.....
Del.	1112	900	950	1100	1230	1380	.....
Md.	1654	2000	1510	1200	1650	1910	.....
Va.	1304	2040	940	890	1590	1060	.....
Wis.	1688	1750	1800	1760	1690	1440	.....
Wash.	2198	1610	2680	2300	2410	1990	.....
Oregon	2636	1420	3440	3880	2600	1920	.....
U. S.	1844	1854	1915	1953	1858	1640	.....

* Rainfall for pea season least of any on record.

of lime needed for a particular soil. The amount of lime needed can be calculated indirectly from pH if the soil's characteristics are known or from lime requirement tests.

The kind of lime necessary can be determined by calcium and magnesium tests run at same time with pH. For example, rapid tests have shown that about 10 per cent of the acreage of Seabrook Farms has optimum pH values but insufficient calcium for maximum crop production. Such soils have low exchange capacity and small applications of limestone have made appreciable changes in pH. An examination of only the pH of these soils is insufficient since the pH value may be about 7.0 and yet there is insufficient calcium for good yields. Further additions of ordinary limestone in amounts to supply sufficient calcium raise the pH value to a point which is incompatible with good growth.*

In several cases, where dolomitic limestone has not been used, crop failures have been traced by rapid soil tests to a deficiency of magnesium. In the latter case, use of dolomitic limestone soon corrected the situation.

"Trouble Shooting"

As has been pointed out, we have attempted to use rapid soil tests as a means of prevention rather than cure. Prior to the establishment of the Research Division, soil tests were used only for "trouble shooting" after unsatisfactory crop yields. We now make the analysis before the crop is grown and from our measures of requirements we find necessary for good crops, we can determine what applications should be made of fertilizer, lime, and organic matter. In other words, rapid soil tests have replaced the practice of growing a crop and if not satisfactory, investigating the reasons after failure had occurred. As a result of this system, rapid soil tests are being called upon to a lesser extent for the purpose of "trouble shooting." Some still has to be done, but it is hoped that eventually we may have sufficient fore-knowledge to practically eliminate the need for it.

In the past, results from this laboratory have traced poor crop yields to be due to lack of sufficient organic matter, calcium, magnesium, major fertilizer nutrients (on private farms), to improper pH, to excess sodium and fertilizer. The rapid tests have not been very valuable in diagnosing trace element deficiencies. However, by eliminating many other possible causes of crop failure, they have turned the direction of investigation to this and other channels. It may be pointed out here that "trouble shooting" can be practiced successfully only after much information relative to the soil and plant has already been gathered.

Conclusions

On the basis of results obtained by the G. L. F.-Seabrook Farms Raw Products Research Division, rapid soil tests for this area are considered to be definitely worth while. Rapid soil tests have been but one of the tools used to gather information concerning vegetable crop production. The value of this particular tool has grown as our knowledge concerning the tests and the manner in which they can be put to use has increased. They have been used primarily as a means of preventing nutritional ailments rather than curing them.

This laboratory has analyzed about 10,000 samples of soil, representing approximately 25,000 acres of South Jersey fields. Careful studies as to methods of sampling, determination, and interpretation of results have made possible the practical use of rapid soil testing. Specifically these tests have:

(1) Provided a measure for the amount of lime and organic matter

* An experiment is now being conducted to determine a satisfactory method of adding extra calcium to such soils. Calcium from neutral carriers such as gypsum looks promising. There is also the possibility of using large quantities of a very coarse limestone. In the latter case, the solution of the limestone is not rapid enough to raise the over-all pH too high. However, roots in contact with a large particle may absorb sufficient calcium for their needs.

essential for growing good vegetable crops.

(2) Furnished information to correct conditions in trouble fields due to calcium, low organic matter, or some other factor.

(3) Furnished a measure for the determination of the amounts of soil nutrients most desirable for growing lima beans, peas, spinach, tomatoes, and asparagus in this particular area.

(4) Furnished a guide for applying lime, fertilizer, and cover crop practices.

(5) Confirmed the results from fertilizers used and indicated necessary changes of the formulae.

(6) Provided a more accurate measure of lime practice by showing the amounts of calcium and magnesium in the soil as well as the level of pH.

(7) In general, checked on prevailing farm practices and in certain cases suggested new ones. For the latter, the rapid soil tests have not only served as an initiator of research but have been used as a means of determining the adequacy of new measures suggested.

References

1. Hester, Jackson B., J. M. Blume and Florence A. Shelton, *Rapid Chemical Tests for Coastal Plain Soils,* Va. Truck Exp't. Sta. Bul. # 95, 1937.
2. Morgan, M. F., *Chemical Soil Diagnosis by the Universal Soil Testing System.* Conn. Agric. Exp't. Sta. Bul. 450, 1941.
3. Peech, Michael and Leah English, *Rapid Microchemical Soil Tests,* Soil Sci., 57, 167-195, 1944.
4. Thomas, R. P. and R. C. Williams, *A Comparison of Results of Rapid Tests With the Amounts of Available Nutrients Obtained by Quantitative Methods on Maryland Soils,* Soil Sci. Soc. Proc. I, 243-257, 1936.
5. Wolf, Benjamin, *Rapid Determination of Soluble Nutrients in Soil and Plant Extracts,* Ind. Eng. Chem., Anal. Ed., 15, 248-251, 1943.
6. ——— ———, *Determination of Nitrate, Nitrate and Ammonia Nitrogen.* Ind. Eng. Chem., Anal. Ed., 16, 446-7, 1944.
7. ——— ———, *Soil Fertility's Effect on Asparagus,* Better Crops With Plant Food, 28, 24-26, 1944.

Our Best Gift

(*From page* 5)

spoke them. The short guy who climbed a sycamore tree to see the Teacher better, the one who had some honest doubts and wasn't afraid to have them all cleared up; and the one-eyed chap from Tarsus who began with more gusto than good will and ended up with enough of both to last through persecution, shipwreck, and prison.

They all had what it takes to meet a crisis and to conquer a cloud of false witnesses and fears. In my humble opinion, it's what we can use to best advantage now, and that's why us average, every-day guys fall back upon Christmas and the Good Book to make us men of gusto plus. That "plus" had better be the root and germ of confidence, or Christmas will be fit for only Scrooge himself.

To make good on this resolve, therefore, we enter the cluttered attic and come forth with dust and cobwebs festooned over an old box of hoarded Christmas tree lights and tinkling baubles to decorate its branches. Sure, we might have bought some brand new shiny ones, but the memories heaped in that old battered box which antedate the battle of the Bulge and the fracas of Coral Sea are worth preserving.

You don't need to invoke the spirit of Pandora to make old dreams live anew upon lifting its lid. For here in tissue wrappings are the gew-gaws that the boys bought with their first money earned, and so wisely expended to cheer up our homestead hearth on the night before Christmas.

Of course, if you have "retired" from active parenthood for a small apartment suite, it won't be practical to give storage space to pure sentimentality. In such cases, the only recourse is the images rousted up from forgotten holidays by the mesmeric power of your mentality. Maybe they'll do just as well as the old relics aforesaid to keep you on the beam, not just for now, but always.

IN either event, while you indulge in anticipatory preparations on the trimmings, the Good Wife is going through her well-thumbed and spattered cookbooks or polishing the silverware and candelsticks, while the girls are dusting and freshening the curtains and putting red bells near window-panes. The final touch on this happy interlude is to place the hemlock boughs above the fireplace and hang the ribboned wreath upon the white front door. This means you are ready for the carolers, with warm heart and a strange, unwonted sense of Peace.

Finally, in early eventide they shuffle through the snow banks and gather quietly around the community doors. At a signal their fresh young voices—a new generation of them, by the way—burst forth in chorus of a cheery kind, singing that hymn that Madame Schumann-Heink's rich contralto once proclaimed. You recall how Paul Turner used to rehearse those neighborhood kids in the lyric stanzas of good will, ending up with a temperance punch bowl and a layer cake. For several Yuletides now his boys have been absent, but he still serves as maestro for the mummers and keeps the candles lit in the big house on the hill. Maybe that's a sort of signal to those of us who never joined his vocal throng—to likewise keep the gusto and goodwill a-burning, lest we brood too much on uranium and man's unholy skill.

Probably we can thank heaven for this new generation lifting their voices in rah-rah for Christmas. In fact, we tie our hope for Confidence right to the Youth who are taking our places. It must be possible somehow to unite this great body of pulsating, vibrant Youth possessed of so much good-will and amiability into a great band of international power, dedicated to confidence in each other and opposed forever to secret diplomacy, sneak attacks, and scientific perversion, or a race for armed might and lust for conquest.

Oh, sure, I know that while I write this there are discords and hatreds flaring up and suspicion and greed running rampant. Only it was probably the need for cures which kept the Good Physician going. If we had all been nice and namby-pamby folks down here, he would never have paid us a visit.

I presume this Era of Confidence which I am hoping for so crazily must get its start right in the middle of our own backyards and sitting rooms and churches and towns. How in "tunk" we can ever expect to infect any large body of outsiders with this virus of virtue unless we get a good stiff communicable dose of it ourselves, I fail to see.

I EXPECT to operate on myself first, and if it doesn't "catch" there eventually I'm sure that some others with far more knowledge of points to be suspicious about are never going to be converted. I suppose one good way to acquire Confidence quickly would be not to read the newspapers. One of their mainstays in life is to put display lines over all kinds of plain and fancy suspicion. With a few exceptions, the gilt-plush columnists fan the fires of suspicion, too. Even the so-called comics feature warfare, revenge, and sly intrigue. If you expect to escape it by scanning the sports page, I'm sorry for you again.

The Government itself is the butt of constant and fiendish suspicion, innuendo, and blackmailing. Too often we rely upon abusive and slandering tactics to put our partisans in power. If we could find a way to reduce the appeal of prejudice and suspicion in

winning this or that objective, we'd be on our way in no time.

I see by this time that I have committed an error. Instead of holding up Confidence for a shining goal I've been guilty of emphasizing my lack of confidence. So this only proves what I just said, that charity must begin at home.

To put it just a little straighter—I've got to have Confidence in the other guy and also enough courage and tenacity to argue him out of any lack of Confidence he exhibits unjustly. This heads off again into a further maze of conjecture. What and when are we to distinguish between objects worthy of Confidence and others utterly unworthy of it? This has but one safe answer.

Education unhampered by subsidy or theory is the best source of a clear mind, and Confidence remains free only in a clear, unbiased mind. That and closer acquaintance. The ones we are the most suspicious about are usually those we don't know very well.

I dare say we can't get far in religion unless we have that sort of education dispensed widely and universally. In fact, I guess that is religion, after all.

It would be a dirty shame, after the Government has paid the expenses of so many next-generation-runners on wide-world excursions to foreign lands, for us to fail for want of international Confidence based on first-hand facts.

I THINK they are going to be clear-headed about it, these kids who soon will govern us. I have heard many of them say that things "stink" too much. Maybe they will scatter some of the Christmas essence and incense around so we can take a fresh start, in a fresher atmosphere.

So I am going to hang up my sock just the same, with confidence in Confidence and three cheers for Christmas. To do anything short of that is to sell our birthright for a mess of suspicion and let us in for more and bigger battles. I prefer fresh air and sunshine to a bed with Mister Groundhog.

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Free! **This handsomely-illustrated 24-page booklet is based on the film and is filled with full-color pictures taken from the film.** ***It is yours for the asking!***

THIS MAKES SCENTS, TOO!

Three tough Marines back on leave from the Pacific dropped into a cafeteria for a snack. It was crowded and the only table they could get was one at which an old maid was sitting. Reluctantly they took it and winkingly they began a "fixed" conversation, the idea being to make the old gal hurry up eating and scram.

Said Marine No. 1: "Boy, I'm glad I'm back. First thing I do tonight is take a bath. I ain't had one for ten months."

"Ten months?" cried the second. "I haven't changed my underwear in a year. Japs kept us that busy."

"*Change* your underwear?" sneered the third. "If it's anything like mine, it'll have to be blasted off! Mine's grown onto my skin."

"Pardon me," interrupted the quiet spinster at this point, "would one of you stinkers mind passing the sugar?"

Mother—"Who ever taught you to use that dreadful word?"

Son—"Santa Claus."

Mother—"What do you mean—Santa Claus?"

Son—"When he fell over the chair in my bedroom on Christmas eve."

Women's styles have changed but their designs are still the same.

"I like to take experienced girls home."

"But I'm not experienced."

"You're not home yet, either."

A young couple had just returned from their honeymoon. One of the bride's friends immediately called on her, and by way of making conversation asked:

"And how did John register at the first hotel you stopped at?"

"Oh, just fine," replied the bride happily.

EASY MONEY

"I'll give you five dollars," said the artist, "if you'll let me paint you."

The old mountaineer shifted his tobacco from one cheek to the other and back again. "It's easy money," he replied, "haint no question 'bout thet. I'se jest wondering how I'd get the paint off afterwards."

Mary had a little wolf
She fleeced him white as snow . . .

First Wife: "How did you break your husband of the habit of staying out nights?"

Second Wife: "He came in at 10 one night and I called, 'Is that you, Bill?' "

First Wife: "How did that help?"

Second Wife: "His name is Tom."

"Can I change these pants at this counter?"

"Well, I'll tell you lady, we have quite a few men shoppers, so maybe you'd better go into the dressing room."

In America a man can have only one wife—which is called "monotony."

Need for—

BORON IN AGRICULTURE

Authorities have recognized that the depletion of Boron in soil has been reflected in limited production and poor quality of numerous field and fruit crops.

Outstanding results have been obtained with the application of Borax in specific quantities or as part of the regular fertilizer mix, improving the quality and increasing the production of alfalfa and other legumes, table beets, sugar beets, apples, etc.

The work of the State Agricultural Stations and recommendations of the County Agents are steadily increasing the recognition of the need for Boron in agriculture. We are prepared to render every practical assistance.

Borax is economical and very little is required. It is conveniently packed in 100 lb. sacks and stocks are available for prompt delivery everywhere in the United States and Canada. Address your inquiries to the nearest office.

PACIFIC COAST BORAX COMPANY

NEW YORK CHICAGO LOS ANGELES

BORAX

for agriculture

20 Mule Team. Reg. U. S. Pat. Off.

"I started handling V-C Fertilizers the year you were born"

TO this young soldier, happy to be back once more with his family and friends, the V-C trademark is a symbol of home. Ever since he can remember, his father has been selling V-C Fertilizers and more and more good farmers in his neighborhood have been buying and using V-C Fertilizers.

For generations, in many communities in many states, Virginia-Carolina Chemical Corporation has been making and holding friends . . . agents and dealers, like John Smith & Son . . . and thousands of good farmers who try V-C Fertilizers and then keep on buying and using V-C Fertilizers.

Such long-established loyalty among so many fine folks is a mighty sound endorsement for V-C Fertilizers. It means that year after year V-C scientific research, V-C practical farm experience and V-C manufacturing skill continue to provide better and better V-C Fertilizers for every crop on every soil on every farm.

It also means that when you buy V-C Fertilizers, you are getting an honest and dependable product manufactured and sold by people who value your friendship and your confidence.

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VC FERTILIZERS

LEADER IN THE FIELD SINCE 1895

Useful Information for the Busy County Agent

Today the County Agent is guide and mentor to millions. His job of helping farmers grow better crops has taken on new proportions. Now he is directly responsible for the success of Victory Gardeners who are doing so much to increase America's food supply.

One subject on which the County Agent wants to be well-informed is the protection of seed against soil-borne and seed-surface fungi. Seed protection is important in any season—and is especially important in a cold, wet planting season like the one just past.

Write today for latest reports on the use of Spergon to protect seed; increase emergence; stimulate growth; improve stands and yields. Information about this non-injurious, easy-to-use seed treatment deserves a place in your working library.

Advantages of Spergon

- Safe to use—cannot harm delicate seeds, even when used in excess.
- Safe for user—non-poisonous and non-irritating to those applying it to seed.
- Long lasting—Spergon does not deteriorate with age; may be applied months in advance of planting.
- Self-lubricating. No graphite needed in drill.
- Compatible with legume inoculants.

TYPICAL DOSAGES

Corn	1½ oz. per bu. seed
Peas	2 oz. per bu. seed
Beans (including Limas)	2 oz. per bu. seed
Soybeans	2 oz. per bu. seed
Sorghum	1½ oz. per bu. seed
Flax	2 oz. per bu. seed
Peanuts, 3 oz. per 100 lbs. seed	

Spergon

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SEED PROTECTANT

UNITED STATES RUBBER COMPANY

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Serving Through Science

THE PLANT SPEAKS

A new four-reel series of 16 mm., sound, color films which may be booked independently or in any combination. They may be used to best advantage when shown at least one day apart and in the following sequence:

THE PLANT SPEAKS THRU DEFICIENCY SYMPTOMS pictures soil depletion, erosion, and deficiency symptoms on plants. (Running time 25 min. on 800-ft. reel.)

THE PLANT SPEAKS, SOIL TESTS TELL US WHY depicts taking soil samples on the farm and the interpretation of soil tests. (Running time 10 min. on 400-ft. reel.)

THE PLANT SPEAKS THRU TISSUE TESTS shows the value of tissue testing and the procedure for testing plant tissues in the field. (Running time 14 min. on 400-ft. reel.)

THE PLANT SPEAKS THRU LEAF ANALYSIS evaluates leaves in plant growth and leaf analysis in determining fertilizer needs. (Running time 18 min. on 800-ft. reel.)

We shall be pleased to loan these films to agricultural colleges, experiment stations, county agents, vocational teachers, responsible farm organizations, and members of the fertilizer trade.

OTHER 16MM. COLOR FILMS AVAILABLE FOR TERRITORIES INDICATED

Potash in Southern Agriculture (South)
In the Clover (Northeast)
Bringing Citrus Quality to Market (West)
Machine Placement of Fertilizer (West)
Ladino Clover Pastures (West)
Potash from Soil to Plant (West)
Potash Deficiency in Grapes and Prunes (West)
New Soils from Old (Midwest)
Potash Production in America (All)
Save That Soil (All)

IMPORTANT

Requests should be made *well in advance* and should include information as to group before which the film is to be shown, date of exhibition (alternative dates if possible), and period of time of loan.

American Potash Institute
1155 Sixteenth Street
Washington 6, D. C.

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